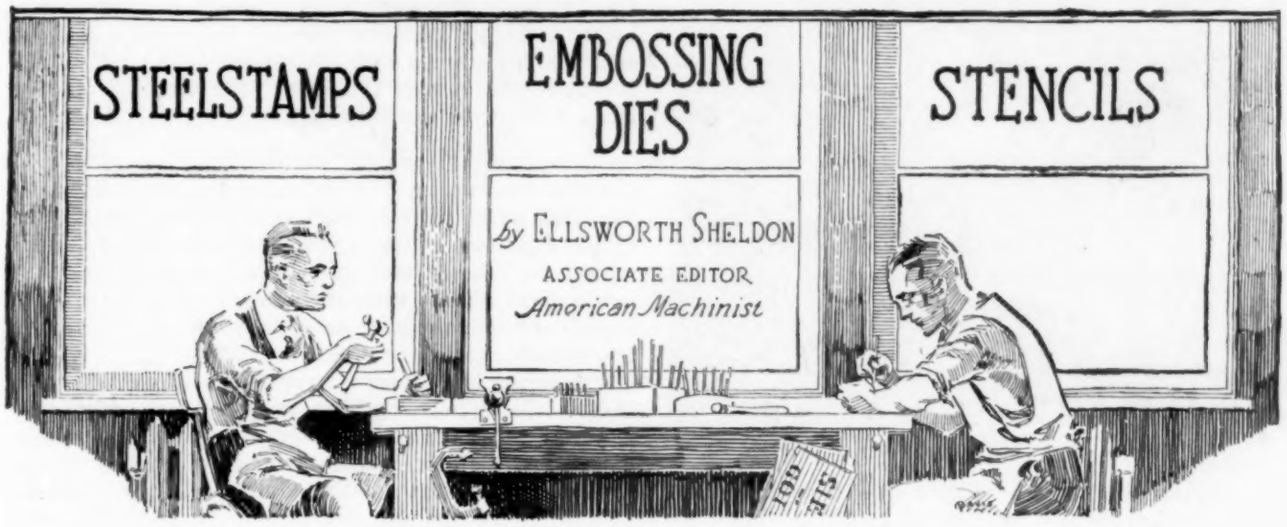
October 28, 1920 American Machinist Vol. 53, No. 18



A BUSINESS directly allied to the machine industry, but in which machinery counts for little and craftman's skill figures very largely, is the making of steel stamps and dies for pressing or embossing letters and figures upon other metals, including steel.

These stamps are made in infinite form and variety; the common steel letter or figure familiar to everyone who has to do with machinery being the simplest and most crude. From these simple tools, which leave their impression upon whatever machine or part of machine it is desired to mark with no other manipulation than holding the character in the operator's fingers and striking a blow with a hammer upon the end of the shank, the cycle of evolution comprises single characters with shanks nicely finished to fit holders that will adapt them to press or marking machines; combination of letters to make words and sentences or of figures to make numbers, or both, all upon one shank; single characters, and sometimes complete words made interchangeable to make words and sentences, capable of being taken out of their holders and others substituted therefor as a printer changes his type to keep abreast of changing conditions; interchangeable characters to fit holders of special form to keep the resultant marking always in the same place with respect to the work; characters which become parts of rotating wheels, and serve to leave their distinctive marking upon moving work or upon curved surfaces where a pressure in one direction would not suffice; and many other forms.

There are two ways of making such tools, so far as the cutting of the actual design is concerned. If a sufficient quantity is to be made and it is essential that there should be no variation between individual stamps of one series, a master die, or hub, as it is called, is cut by the engraver which is an exact inverse or matrix of the letter or design that is desired. This "hub" is then hardened, and is used as a die with which to form the stamps.

To make a stamp from such a die, a piece of steel of suitable size and length is roughly shaped upon the end, located squarely over the impression in the master die and struck lightly with a hammer. This first blow will leave the outline or a part of the outline of the design upon the steel. Perhaps only one or two spots may show evidence of having been in contact with the die, but such places as do show the mark of the die are then cut away by means of chisel or file, the stamp relocated on the die in as nearly as possible the same place as before and again struck with a hammer.

Every toolmaker knows that if he has the impression of a steel letter in a hardened steel block he can in a very few minutes reproduce the letter that made it by the simple processes of hammering and filing. What he probably does not know is that a majority of commercial stamps are made by the same process; somewhat refined, to be sure, over the emergency method of the man who wants his letter NOW, *but nevertheless the same in principle.*

By alternately striking the stamp on the die and cutting away the parts that show evidence of contact, the remaining metal soon reaches the bottom of the impression in the die and has become a steel stamp that only needs to be trimmed up and properly tempered to be capable of leaving on a smooth surface an impression that is the exact duplicate of the die that produced it. It is by this or some analogous process that most of the steel stamps are made which are used for marking trade names, designs, etc., upon the countless millions of small articles of metal or other material that are upon the market.

Whether or not a stamp made by this process is a "good" stamp—that is to say, whether or not it will stand up under constant service—depends upon several things, one of the most important of which is the nature of the material upon which it is to be used. Used as a part of a mold for forming and at the same time lettering or marking a plastic material that "sets" or becomes hard, either by baking or other process after the marking is done, such a stamp will last indefinitely.

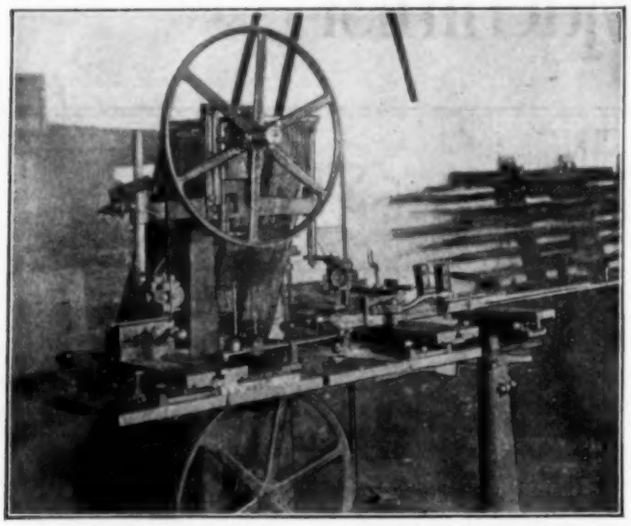


FIG. 1. THE STOCK IS CUT WITH A BANDSAW

If the stamp is to be used upon iron, steel, or similar hard material, its life will depend somewhat upon the time and skill devoted to its making. It is quite possible to make a stamp by driving it forcibly into the hub without any cutting at all.

FIG. 2. ENDS OF BLANKS ARE SQUARED BY FILING IN THIS GAGE

Such a stamp, however, would last but a very short time when used upon iron or steel, for the reason that the fibers of the metal have been broken down; the molecules have been disturbed with relation to each other and forced to flow under the pressure of the blows, the steel having been driven down in some places and raised up in others exactly in the same way as a plastic material would behave under similar conditions. On the other hand, if the blows struck by the artisan have been light and he has conscientiously cut away all the material where it has been in contact with the die, it is quite possible for him to have let the character entirely into the die without having flowed or swaged the metal. To do this well takes not only a longer time but a higher degree of skill, and such tools necessarily cost more than the same design would do if it were swaged into the die in three or four blows. The extra cost is usually justifiable on stamps that are to be used for continuous service, for they will approach in lasting qualities the strictly hand-cut characters.

Hand Cutting or Engraving

The other principal method of making such stamps is by hand cutting. Files, chisels and gravers are the only tools used after the design is on the metal.

The symmetry of hand-cut stamps is entirely dependent upon the artisan's skill of hand and eye. Though the design may be drawn upon the steel and the stamp cut by different men, it is not usually so done, for the work is engraving and the worker an artist.

Hand-cut stamps are unquestionably the best, when length of life and sharpness of impression are considered, but where a certain design must be reproduced again and again by reason of even the best of stamps wearing out from continued use, not only would the cost of such stamps be prohibitive but exact duplication could not be depended upon because, though a skillful worker might make a thousand similar stamps each artistically perfect, it would be out of the bounds of human possibility for him to make a thousand exactly alike.

Continuous Duplication

Exact duplication, even to many thousand pieces, is practical with the hub method of production by the simple expedient of letting the first stamp cut from the master die become itself the master, used only to make new master dies to replace those whose product, when examined under the microscope, show signs of variation or distortion.

Tempering is, of course, a very essential consideration in the life of a stamp that is to be used upon hard material, but as imperfect tempering would be equally disastrous to either hand-cut or hubbed stamps, it was not mentioned among the important qualifications. Tempering stamps that are to be used upon soft materials is a minor consideration; indeed, many if not most of the tools to be used on such work are made of hard bronze.

Relative Cost of Methods

The cost of *one* hubbed stamp would be more than the cost of a single hand-cut stamp of the same design. The cost of *two* hand-cut stamps would, obviously, be twice the cost of one, but the cost of the second *hubbed* stamp would be but a small percentage of the cost of the first one. This is a consideration quite as important, where continued replacement is concerned, as the comparative life of the two kinds of stamps. For this reason probably the majority of steel stamps are hubbed, while a larger proportion of brass and bronze designs are engraved.

Various grades of tool steel are used to make stamps. Any steel that will make a good cutting tool will do, but the nature of the work and life of the stamp must be considered when selecting material. As the material cost is but a small part of the expense, economy demands that the steel best suited to the work in hand be selected without reference to the cost.

In the factory of the Pittsburgh Stamp Co., 316

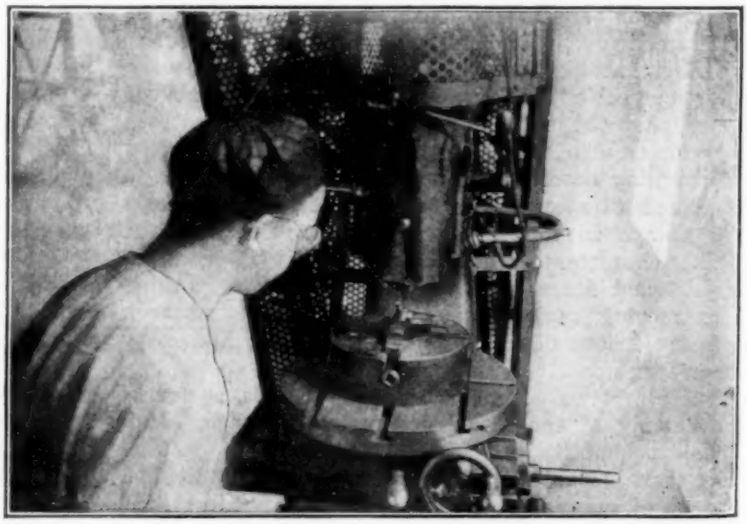


FIG. 3. INTRICATE DESIGNS ARE ROUGHED OUT BY ROUTING

Penn Ave., Pittsburgh, Pa., where the material for this article was obtained, the stock is received in bars from ¼ in. square up to rectangular sections 4 in. wide and is cut to length with the band-saw shown in Fig. 1.

The machine is equipped with two movable vises and both sides of the band are used. The capacity of the vises is 4 in. square and when sawing small bars the vise is filled at each pass, thus cutting off a number of pieces at a time. The vises are mounted upon a slide and a chain extends from each vise over a guiding sheave to a weight at the rear of the machine.

This method of cutting off stock leaves the ends of the pieces square and smooth without the necessity for redressing, while the gravity feed suits the rate of cutting to the hardness of the material and the sharpness of the saw teeth. On the majority of stamps there is no further work on the pieces; they go from the cutting-off saw directly to the engravers.

If the work is the cutting of standard letters or figures, or is to be of some design that has been made before, there will be a matrix or hub ready to the engraver's hand. He will take the pieces one at a time, holding them in a hand vise across the corner of his bench or filing block, and point one end roughly to the shape of the character he is to make.

Preparing the Blank

The filing gage, Fig. 2, is a V-block of suitable size and shape to hold conveniently in the hand, with a hardened steel disk so attached to one end that its surface is square with the center line of the V. Laying one of the pieces in the V with its pointed end flush with the surface of the disk, a few strokes with a flat smooth file corrects any little variation from squareness that the band saw may have left. The stock is not allowed to project from the gage, but the file is held in contact with the disk and the work pressed against it with the thumb of the left hand. One or two strokes of the file serve to accomplish the desired result and the blank is ready to be cut.

If the character is small there is no preliminary work upon it; it is placed squarely upon the matrix and struck lightly with a hammer. Sometimes the end of the piece is copper coated by dipping it in a solution of blue vitriol, the film of copper serving to show to better advantage where the work has been in violent contact with the die. The engraver then catches the piece in the bench-vise and with chisel, file or graver proceeds to cut away the metal from the contour of the character.

The engraver's skill enables him to form a pretty good letter with only the faint marks of the first impression to guide him, but if at any time the clues become too indistinct for him to follow, it is but the work

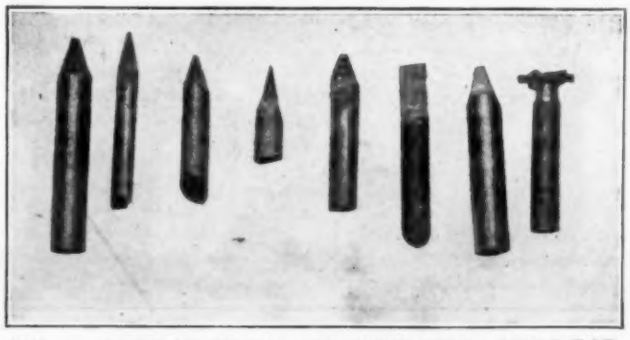


FIG. 4. ROUTING TOOLS ARE MADE FROM DRILL-ROD

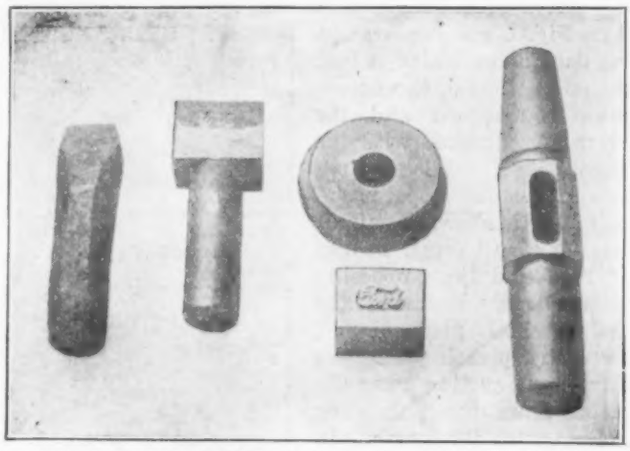


FIG. 5. STAMPS ARE MADE IN VARIOUS FORMS

of seconds to place the piece over the matrix, the latter guiding it to place by means of the partly cut letter. Three or four repetitions of this process and the engraver is ready to lay down any ordinary single character a perfectly finished letter and take up another piece.

Reversing the Process

If the work is an intricate design incorporating several letters the process, or rather the manner of applying the matrix, is reversed. The matrices for this work, instead of being cut in the face of a heavy block, will be cut on the end of a piece of square stock just large enough to receive it. The work will be held in the bench vise, the surface coppered, and the design laid out upon it. The steel may or may not be cut away before using the matrices, according to the judgment of the engraver. These men are perfectly capable (and indeed every day are called upon to do it) of laying a new design and cutting it entirely into the steel without the use of matrices at all. When such a design is to be made in raised letters there is, of course, a comparatively large area of metal to be cut away, and the routing machine shown in Fig. 3 is called into service.

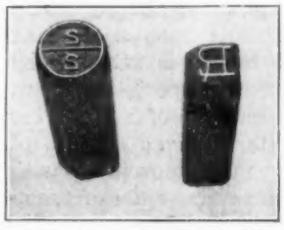


FIG. 6. A COUPLE OF HAND-CUT STAMPS

Routing Surplus Metal

The router is an ordinary profiling machine having the usual movements; rotary movement of the spindle with vertical adjustment, and a rotary movement as well as horizontal movement in both directions for the table. Tools, shown in Fig. 4, are usually made from drill rod with no other aids than a file and a speed lathe, though small milling cutters are sometimes used that are made upon the milling machine. Only the roughing out is done upon the routing machine; the finishing in all cases is entirely a matter of hand work.

Samples of Stamps

Samples of steel die work are shown in Figs. 5, 6 and 7. In Fig. 5 are shown a "hammer" stamp and a hand stamp, both to be used where the accurate placing of the impression is not essential; a "wheel" stamp that is part of a special numbering machine that marks stock or parts that are continuously passed through it; and two stamps to be used in a press.

In Fig. 6 are two stamps the design for which is laid out on the metal, the excess stock routed out and the characters finished with the graver. In Fig. 7 is shown a pair of dies for a seal press. In Fig. 7 is shown a pair of dies for a seal press. In dies of this kind the embossing die is usually engraved and the matrix is made of soft metal by pressing the die into it and cutting away the metal from the points of contact with the graver. In Fig. 8 may be seen a wheel-stamp used on a special numbering machine. The characters are all finished by hand engraving. There are two characters in this wheel that require changing from time to time, and these characters are made on insert pieces which are dovetailed into the wheel and held in place with small button-head screws. A similar stamp used to stamp succesive impressions upon a strip of metal is shown in Fig. 9. The holder is attached by screws to a disk that forms part of a special machine. The short section having the appearance of a file is for the purpose of starting the material from a state of rest and bringing it into synchronous movement with the stamp. The characters of the stamp would of themselves do this; but the chances are that the first letter or two would be blurred or distorted. Starting the material before any of the marking characters come in contact with it insures a sharp, clear-cut impression of the stamp.

FIG. 7. A "PAIR" OF EMBOSSING DIES

FIG. 8. AN ELABORATE WHEEL STAMP HAND ENGRAVED

Printing Plates of Brass and Bronze

Another product of the Pittsburgh Stamp Co. is shown in Fig. 10 in the shape of brass plates for printing trademarks and designs on boxes or labels. These designs are sometimes quite intricate and many of them are printed in two colors, involving some very close work in matching the two plates that produce the impression, to avoid overlapping and smudging of color. These plates, like the steel stamps, are cut to line on the routing machine, the design first having been drawn on the polished surface of the brass, and are "touched up" with hand tools.

FIG. 10. PRINTING PLATES MADE OF BRASS ARE ROUGHED OUT ON THE ROUTING MACHINE AND FINISHED BY HAND

One of the plates shown in Fig. 10 is a "figure plate" and is to be cut up into small squares, each containing one number. The individual numbers fit in the opening to be seen at the left end of the other plate and are held in by keys so they may be changed in the same manner as a printer changes the type in his forms.

Embossing Dies

Two pairs of embossing dies to be used in an ordinary punch press are shown in Fig. 11. They are for the purpose of embossing large sheets of tin. Holders are provided for the press of a size suited to the articles to be embossed and the letters are furnished in "fonts;" therefore any desired sequence of letters within the limits of the holder may be set up, and the set-up changed as often as desired. A feature of the holder prevents tripping the press when a letter is out of place and thus preserves the letters from becoming broken by reason of the upper and lower die not matching.

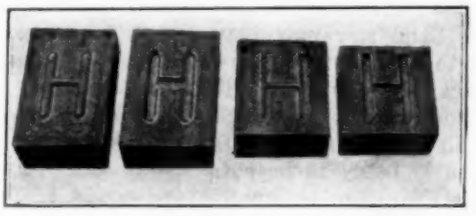


FIG. 11. MOVABLE TYPES ARE USED FOR EMBOSSING TIN AND OTHER SHEET METALS

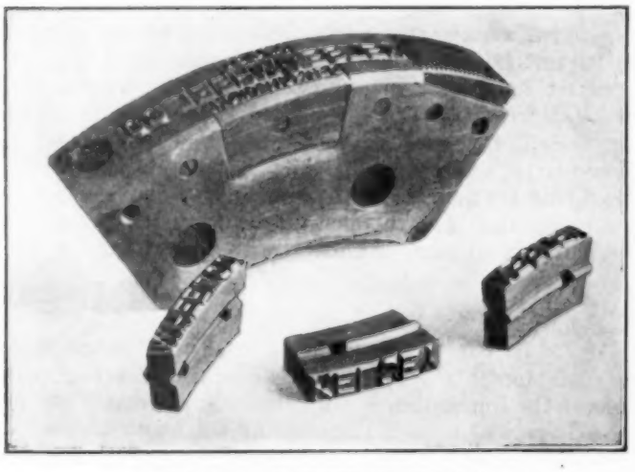


FIG. 9. A SECTIONAL WHEEL STAMP

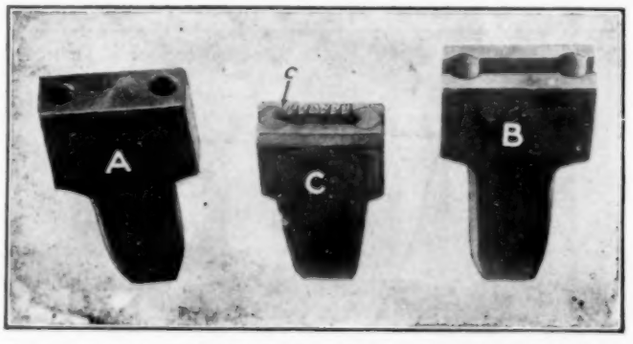


FIG. 12. HAND STAMPS ARE MADE WITH INTERCHANGEABLE TYPE

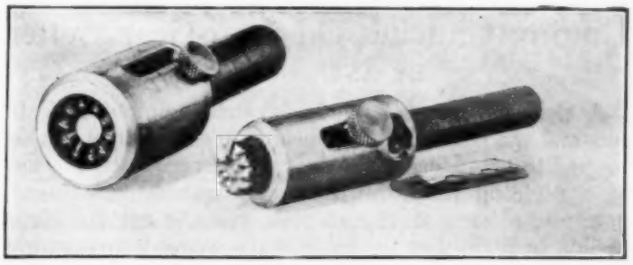


FIG. 13. HAND STAMPS ARE MADE IN MANY FORMS

Another example of the changeable stamp is shown in Fig. 12; this one being a hand stamp. Three pieces are shown to illustrate the three stages of construction, though the three pieces are obviously not the same tool. After the shank is shaped and the surface squared off, two holes are drilled as at *A*, a mill cut run across as at *B*, and then flat-sided plugs are driven into the holes to form the ends of the type-holding channel. In one of these plugs as at *C* a smaller hole is drilled not quite parallel to the axis of the plug and with one side of the hole cutting out of the flat side of the plug. Into this smaller hole is placed a coil spring and a hardened steel ball enough smaller than the hole to travel freely in it, and the hole is then closed by a plug containing a headed steel plunger *c* which rests on the ball.

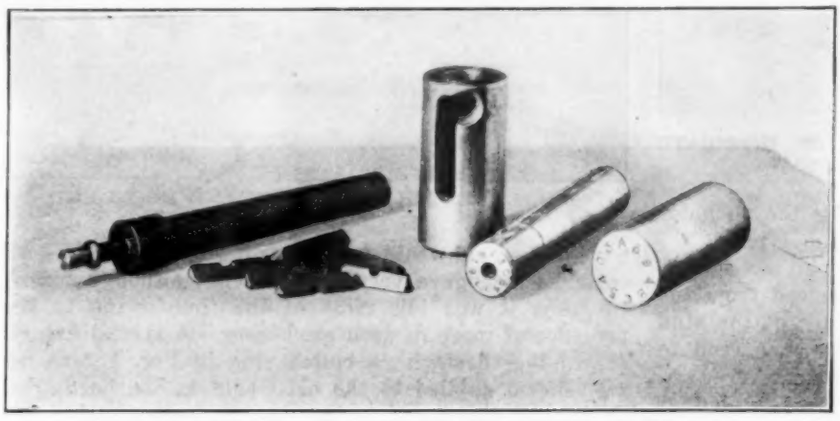


FIG. 14. DETAILS OF THE STAMP SHOWN IN FIG. 13 AND THE WORK IT DOES

The body of the type for this holder is necessarily nicely finished by grinding to exact dimensions and perfect squareness. The outer end of the inclined small hole is slightly nearer the type channel than the other end, therefore when the channel is full of type the ball presses against the line and resists any attempt to pull the type out. By reason of the inclined position of the small hole in which the ball is placed, the harder one pulls to get the type out the more strongly is the movement resisted. Pressing the thumb on the plunger *c* pushes the ball down the hole against the action of the spring, and thus releases the type. Another form of type holder is shown in the two views, Figs. 13 and 14. The individual stamps in this case are carefully milled on the sides to the exact angle that their width equires, so that whatever combination is set up will present a true circle which, if not complete with the characters alone, is filled out with spaces of various thicknesses also milled to their respective angles. The blanks for the type are made in

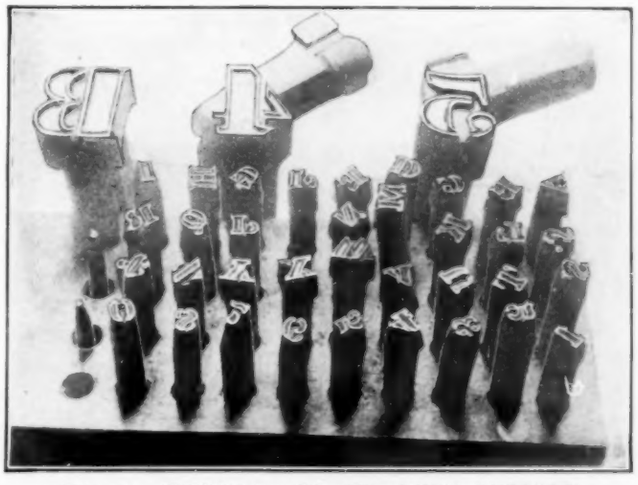


FIG. 15. STENCILS ARE CUT WITH LETTERS LIKE THESE

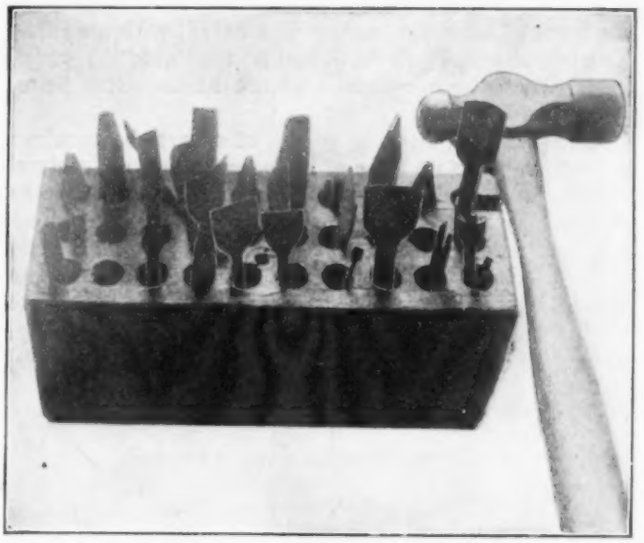


FIG. 16. STENCILS FOR WHICH THERE ARE NO CUTTING LETTERS ARE MADE WITH CHISEL AND FILE

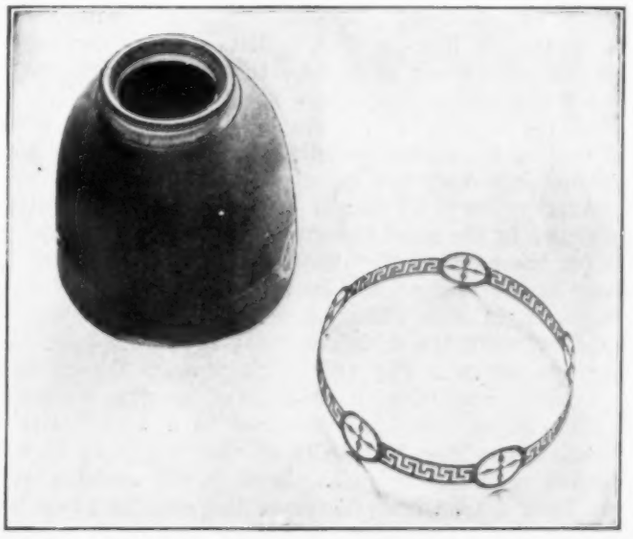


FIG. 17. STENCILS ARE USED TO AID IN SAND BLASTING DESIGNS ON GLASS

the form of bushings, turned and bored, with an annular groove in the bore that becomes the "nick" by which the characters are retained in the holder after being separated.

More than one bushing would, of course, be required to make a complete ring of type, but these characters, like the ones previously described, are made in fonts so that any desired combination of letters and figures can be made. Fig. 14 shows very clearly the construction of the tool. The characters are set up around the central stud, and when drawn back into

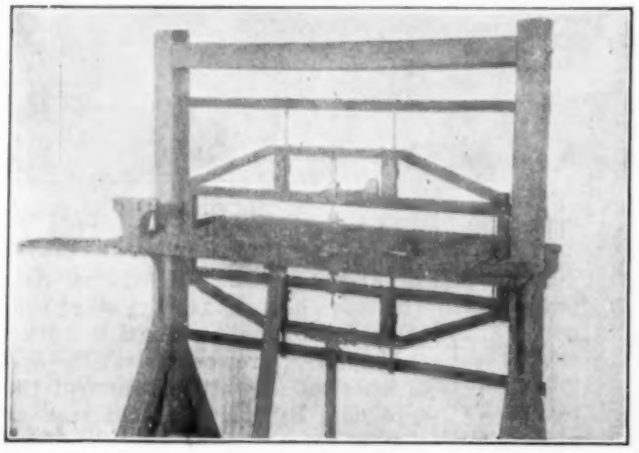


FIG. 18. SOMETIMES SMALL STENCILS OF INTRICATE DESIGN ARE MADE ON THE JIG SAW

the shell are held from dropping out by the shoulder on the stud which fits the "nick" in the type.

The small knurled screw serves to hold the central stud in position. The latter is not removed from the shell to change the setting; a partial turn of the stud after loosening the knurled screw allows the stud to project far enough from the shell to free the type.

The cutting of stencils from sheet brass is another phase of the stamp industry. The stencil cutter's outfit consists of a hardwood block exposing end grain to the surface, several sets of letters like those shown in Fig. 15, and the chisels in Fig. 16.

The stencil is first laid out on the thin sheet brass; roughly if it is to be all letters for which there is a set of stencil cutting letters, Fig. 15; carefully and accurately if it is a design that must be cut with chisels. No other tools than those above mentioned, a hammer and a mallet, are needed except perhaps a small file to smooth up refractory corners. The work of cutting a complete stencil of ordinary size is accomplished in a very few minutes.

Another form of stencil of which large quantities are used in the glass industry is shown in Fig. 17. It is for the purpose of putting the pattern on the glass lamp shade seen to the left. This particular stencil is made in five pieces superimposed and sweated together while the design is being sawed out upon the jig saw shown in Fig. 18. The pieces are then melted apart and reassembled in the form of the ring as shown.

Stencils of this kind are used in a sand blasting machine, the ring being slipped over the glass to the desired position, the shade placed in the machine, and the blast turned on. Wherever the glass is protected by the metal it will remain clear while the surface exposed by the holes in the stencil as well as outside the band will quickly be frosted.

Cutting Clutches On Spur-Gear Cutter

BY A. DEANGELIS

A shop had several hundred ratchet clutch rings to cut, and the only available means of accomplishing this seemed to be an ordinary milling machine with the use of a dividing head. It was very quickly discovered, however, after a start had been made to cut the rings in this fashion, that to complete the entire lot of several hundred would mean a job lasting several months, unless a new machine was bought for the work.

Incidentally it happened to be recalled that the company had an old Gould & Eberhardt automatic spur-gear cutter, which gave very good service, although unfortunately, it was idle most of the time owing to the presence of more modern machinery. A special fixture, shown together with a clutch ring in Fig. 1, was designed and applied to the old Gould & Eberhardt machine, and the result is that the 30-tooth clutches are now being turned out at the rate of one every 28 minutes. To secure the clutch ring in the fixture, an expansion mandrel, shown in Fig. 2, was made.

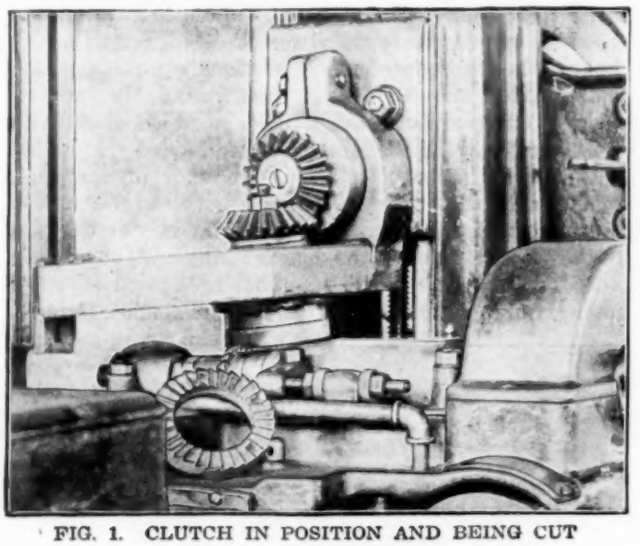


FIG. 1. CLUTCH IN POSITION AND BEING CUT

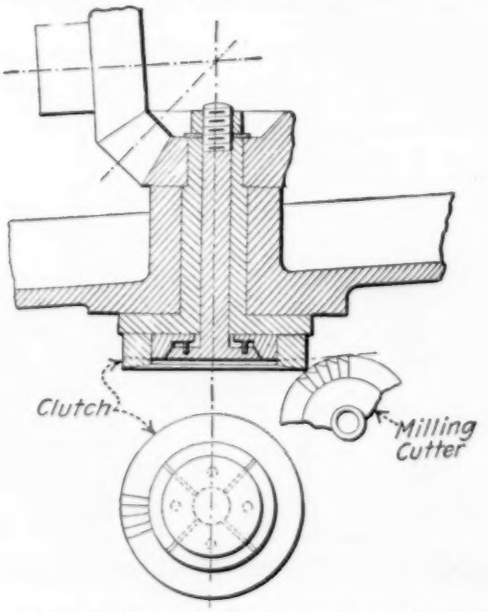


FIG. 2. EXPANSION MANDREL FOR HOLDING THE CLUTCH RING

Tools From a Railroad Blacksmith Shop

BY FRED H. COLVIN
Editor, *American Machinist*

Several machines made necessary by the usual failure to provide sufficient machinery in railroad shops are shown. Some of the methods of punching, shearing and forming metal, however, can be used in a variety of ways and with modern tools. All reflect credit on the iniative and capability of the men responsible for results.

RAILROAD management has always gone on the principle that if you shave the machine shop appropriations, the men will fudge up some sort of a machine to do the work. And they generally do. But almost every other kind of industrial management has learned that this is far from economical.

It has, however, developed the railroad mechanic into a sort of genius for taking a couple of angle irons or channels, a few pieces of scrap steel and an old air cylinder, and building almost any sort of a machine for bending, forging, riveting or what not. This is especially true of the blacksmith shop, and a few of the many ingenious kinks and devices developed by and under Otto Scheutze, blacksmith foreman of the Chicago, Milwaukee and St. Paul shops at Tacoma, Wash., are shown herewith. One of the simplest tools is a punch and die for making the thin nuts used on cross head pins and for similar purposes, these being about ½ in. thick when finished. They are punched out of ⅝-in. stock with the form of punch shown in Fig. 1, and a corresponding die. The center hole is first punched in a preliminary operation. Then the pilot on the punch insures the nut being properly positioned on the strip of steel to get out the blanks with but little loss of metal, as can be seen.

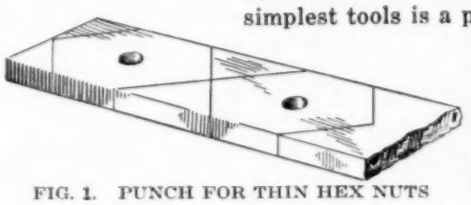


FIG. 1. PUNCH FOR THIN HEX NUTS

A somewhat different type of punch and die, and one which has possibilities in other directions, is shown in Fig. 2. This is for rounding the ends of brake levers but can be used for any similar work.

The body of the die *A*, has a round hole to accommodate the punch *B*. It is raised at the back to support the punch against the side thrust of the cut as it forces its way through the heavy metal.

The die is open at the back to allow the brake lever to be inserted and also open beneath the lever, so that it can be forced down by the punch as it clips off the end to the proper size and shape. The lever is first punched with the hole for the clevis pin and this hole becomes a guide which insures the brake lever being trimmed to the correct length.

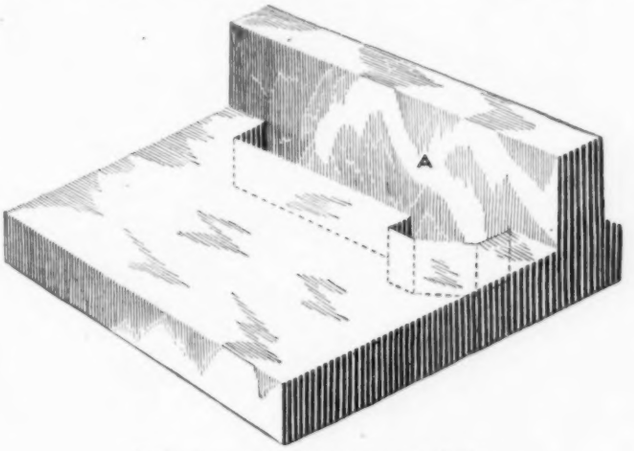


FIG. 3. PUNCHING SPLIT KEYS

SUPPORTING THE THRUST OF PUNCHES

Fig. 3 is a die for trimming split keys for various purposes. The two pieces are cut separately and riveted together afterward. The only feature about the die is the guide *A* which takes the thrust away from the cut. This is a feature in all of the dies designed by Mr. Scheutze.

This thrust block or slide is again noticeable at *A* in

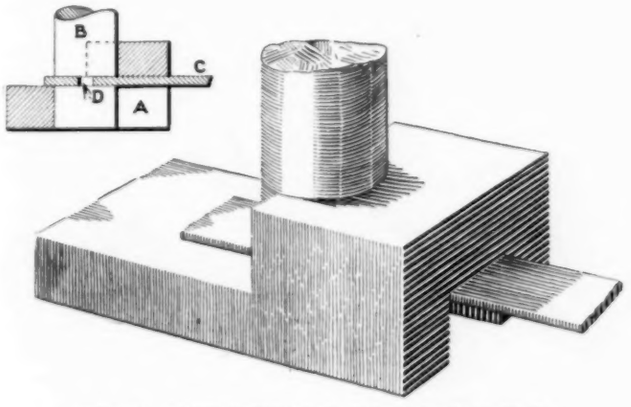


FIG. 2. TRIMMING END OF BRAKE LEVER

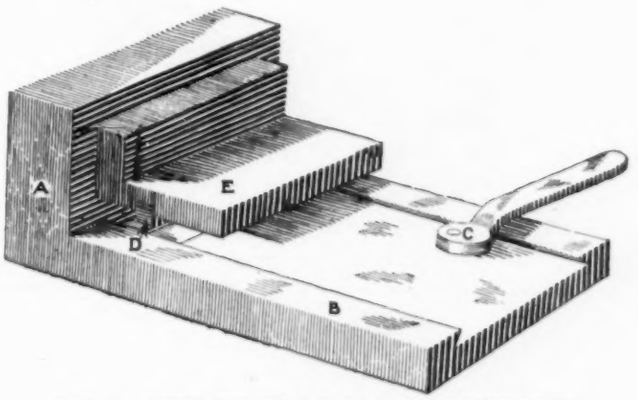


FIG. 4. SUPPORTING A HEAVY SHEARING CUT

the trimming die shown in Fig. 4. This is for squaring the ends of plates 12 in. wide and ½ in. thick. The plate is locked firmly against the raised edge *B* by means of the cam *C* and then the heavy press forces the knife *D* down across the end of the plate. The knife is inserted in the bolster *E* and can be readily renewed when necessary. The thrust guide insures the knife making a square instead of a slanting cut.

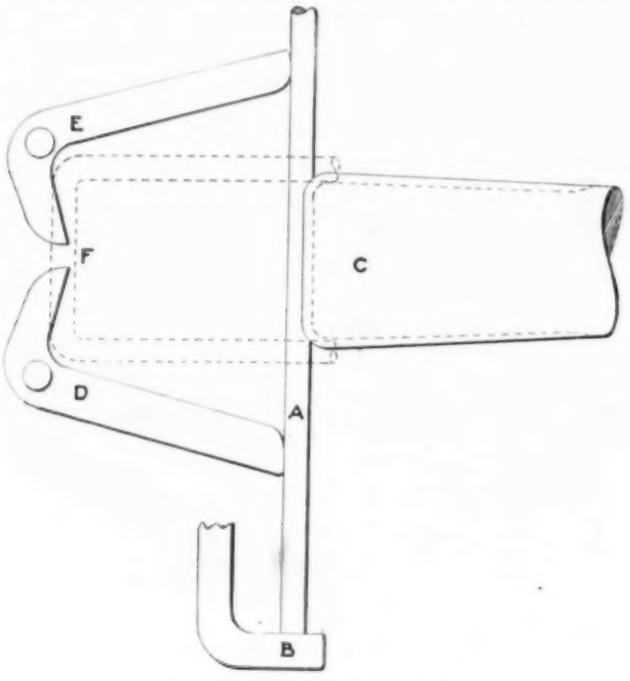


FIG. 5. DIE FOR BENDING U BOLTS

In Fig. 5 is an outline of a die for forming U-bolts in a bull dozer. The stock *A* is heated and put in position with one end against the stop *B*, which is adjustable. Then the ram *C* forces the stock between the jaws *D* and *E*, making an easy bend, until the center strikes the short ends of the formers at F. The continued movement of the ram swings the arms in and forms the work into a straight sided U-bolt with corners just a trifle rounded. The swinging arms bend the rod much more easily and with less power, than where the stock is forced down between the straight sides of a die.

In Fig. 6 is a simple but effective device for cutting off rivet heads in brake beams and similar pieces. The punch *A* has four cutting sides and is held in the ram of the press. The ring *B*, with a thrust piece *C* fastened to the outside, holds the beam while the decapitation is in process. It is a very simple device, easily adjustable for a large variety of work and capable of continuous use over long periods as by simply turning the punch a new cutting edge is provided.

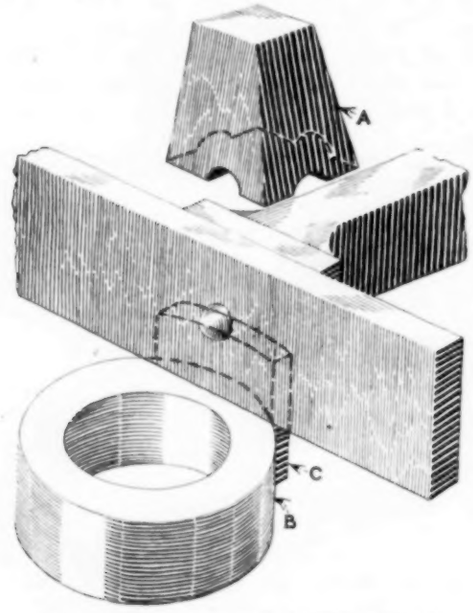


FIG. 6. CUTTING OFF RIVET HEADS

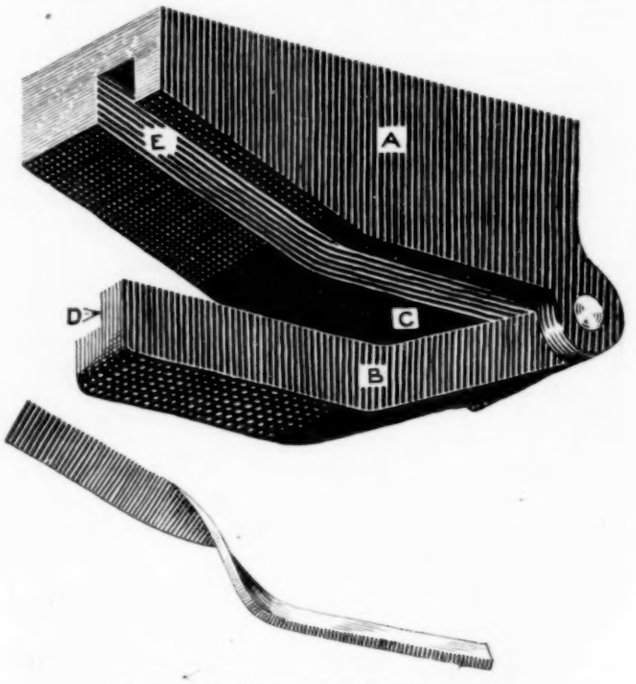


FIG. 7. QUARTER-TWISTING A BAR

A fixture for putting a quarter twist in the end of a flat bar is shown in Fig. 7. It consist of two pieces, the body *A* and the swinging arm *B*. The flat part of the bar is clamped at *C* while the lip *D* folds the end into the opening at E. Such a fixture is capable of many modifications for various kinds of work.

A Home-Made Bending Press

One of the air machines mentioned is shown in outline in Fig. 8. This is a special bending press for fairly heavy cartruck and similar work. A large air cylinder is mounted between heavy channels and a suitable bed plate used to carry the bending fixture which becomes the anvil for the press.

The particular work shown is to make a right angled

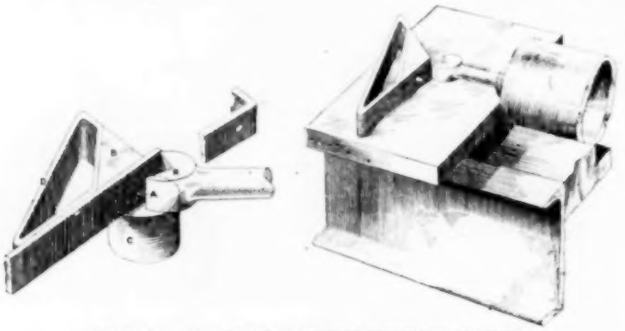


FIG. 8. A HOME-MADE FORMING PRESS

bend near the end of a heavy flat bar, the bend to be at a given distance from a bolt hole which has already been punched. After the bar has been heated the hole is placed over the guide pin *A*, which leaves the end of the bar projecting beyond the corner of the anvil block *B*. Then the air is turned into the cylinder and the ram *R* forces the end around the square corner.

The whole triangular frame is then swung on the large and substantial center *C*, which bears in the bedplate across the two channels. By moving this carefully and gradually, a heavy bar can be bent as desired. The corner of the anvil block *B* must be in the center of the center or bearing block. The triangular frame *D* can be made any desired shape according to the work to be done.

The machines built by Mr. Scheutze and shown in Figs. 9 and 10, are used in reclaiming and repairing draw-heads for the modern couplers. The merits of this design were recognized by the Railroad Administration and used at other points.

The first, Fig. 9, is for shearing the heads off the two rivets in the draw-head, and as these are 1¼ in. in diameter, considerable pressure is required. The bed is made of two I-beams, 20 in. deep and with 7-in. flanges. The main uprights are steel bars, 2⅝ in. in diameter. The cylinder is 18 in. in diameter and the lever arms are respectively 43 and 3 in. giving a leverage of over 14 to 1, for the ram *C*. The ram *D* works on a 16-in. arm, making a considerably reduced leverage. This ram, however, is only for straightening plates and bars.

The air cylinder is tied into place with two 2¼-in. bars, with a heavy recoil spring at the top. The whole press is also mounted on four coil springs on a timber base, to allow it to move with comparative freedom when the reaction from the breaking of the rivet occurs.

In breaking rivets, a block *A* is placed on the bed of the press, and a drawhead put in position as at *B*, handled of course by an air hoist. The draw-head strap rests on the raised portions of the block, leaving space beneath for the drawhead casting when the rivets let go.

Both rams *C* and *D*, are guided in the double plate projection *E*, and are adjusted by screwing up or down on the threaded bar which supports and drives them. The threads are coarse square in form, 32 to 12 in. or 2⅔ per in. The fit is loose enough to be easily adjusted by hand, the ram being run down to contact with the work. Air at 100 lb. pressure is used and a heavy effective pressure built up in this way. But as there are two 1¼-in. steel rivets in double shear, considerable pressure is necessary.

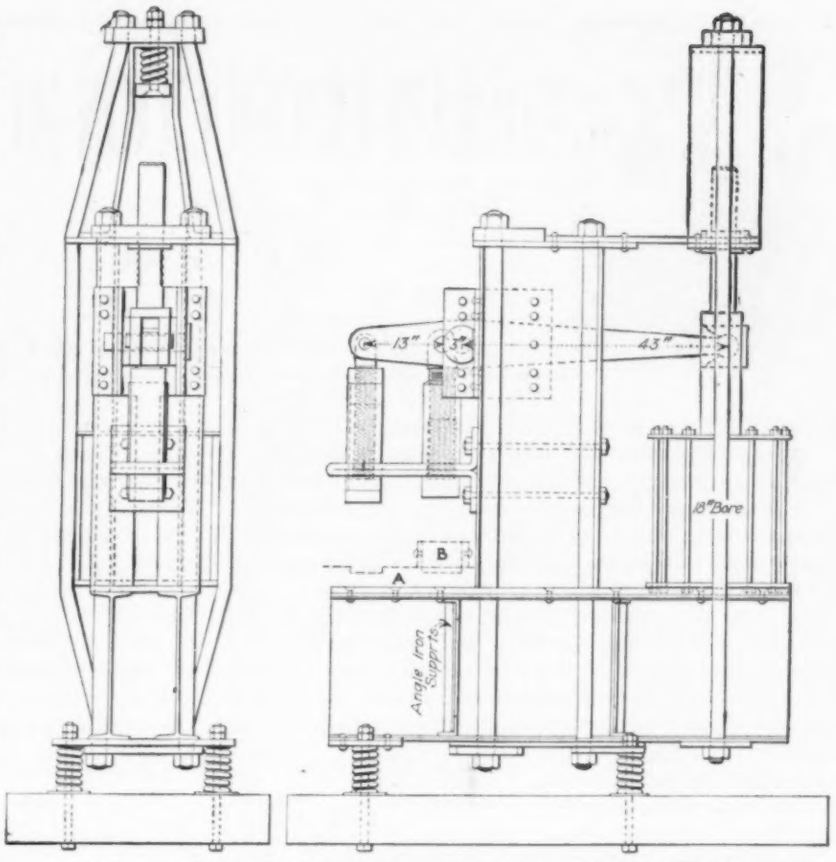


FIG. 9. MACHINE FOR SHEARING RIVETS IN DRAW-HEADS

Adjoining this machine, and part of the same reclaiming plant, is the riveting machine shown in Fig. 10, and used for putting new rivets into place and making the drawhead serviceable once more. The bed is of 12-in. channels, 7 ft. long and carries an air cylinder for the "holder-on" and a rock drill to do the riveting. The illustration shows the combination and leaves little to be said as to its operation. The ram or the holder-on is returned to position by the long spring in the bed, through the medium of the steel cable shown.

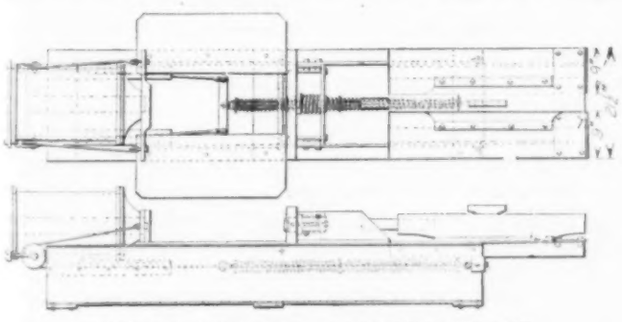


FIG. 10. A COMBINED HOLDER-ON AND RIVETING MACHINE

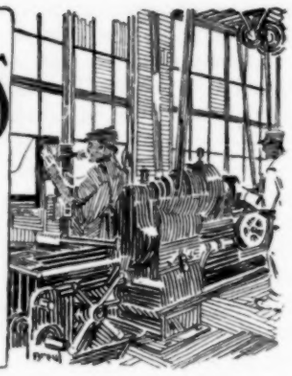
A. S. M. E. Organizes Materials Handling Section

Four hundred members of the American Society of Mechanical Engineers have organized themselves into a "Professional Section on Materials Handling" and will provide primarily a common channel of intercourse between all the technical and industrial organizations cooperating in the solution of engineering problems connected with the handling and distribution of materials and products.

This section will aim to be a bureau of information—complete in its scope, specific in its knowledge of the physical and economic conditions and unbiased in its conclusions.

MODERN PRODUCTION METHODS

By
W P. Basset
of
Miller, Franklin, Basset & Co



GO OUT into your finished stockroom and examine carefully some part which has been manufactured in your plant, say a crankshaft. You can easily see in it the rough forging from which it was machined. The material, or most of it, is still in the crankshaft. That forging is the raw material, and the price paid for it is the material cost of the crankshaft.

You can also readily see, in your mind's eye, the various workmen who perform the turning, grinding and other operations on it. Perhaps this very morning you signed checks payable to these men. Those checks, or parts of each of them, include the direct labor cost of the crankshaft. You can practically see that element of cost in the finished product.

But perhaps you also signed other checks today. There was one for the foreman of the lathe department. He probably never touched the crankshaft, so you can't see in the finished product any evidence of the work done by him, but you know that his supervision and teaching were necessary.

Then there was that big check in payment of the coal bill. No matter how carefully you examine the crankshaft you will see no evidence of coal. A part of that check inevitably got into the crankshaft through a most indirect route—that of boilers, engines, shafting, belting and the lathe.

When you were making out the payroll checks, there were several to the plant watchmen. Careful scrutiny of the crankshaft shows no evidence of the money paid to them. On second thought, though, the mere presence of the crankshaft here, rather than in some thieves' fence, shows that the watchmen had something to do with manufacturing the crankshaft.

While thinking over these elements of cost you may reflectively look upward. You make a mental note that a piece of shafting is loose. You also note that the old building is showing the first signs of disintegration. Sooner or later you realize with an unpleasant jolt, you will have to build a new one to take its place. You haven't written any checks which in any way can be connected with the obvious depreciation of the plant, but you realize only too well that depreciation is a very real expense, which must be met sooner or later, and the money for erecting the new building must come from the sale of this crankshaft and the other parts which you manufacture and sell. It is therefore, an ultimate cost.

Touching the crankshaft again, you note that it is covered with a film of oil to protect it from rust. That makes you think of the other oil which you have to pay for which is used for lubricating the machines on which the crankshaft is turned. While the oil now on the crankshaft is in evidence, you can see no evidence of the lubricating oil on the finished product. It is a material however, which, although it does not appear in the finished product, is a shop supply necessary to the proper operation of the plant.

Most manufacturers I find, although they may be thoroughly conversant with their manufacturing and selling problems, have but a hazy idea of what goes to make up the cost of their products. They are inclined to look upon cost accounting as more or less of a mystery. Actually there is no mystery whatever about it. If the shop executives would only look upon cost methods in the light of their knowledge of manufacturing, they would see that each element of costs and each step in gathering them is logical, and depends upon the methods of manufacturing used in that shop. It is possible to determine the right methods of finding cost for any plant in any industry. In some, the problem will admittedly be simple; in others, it may be exceedingly complex. But it is always a problem to be solved not by accountants but by engineers familiar with manufacturing. They must, of course, know the principles of accounting, but cost finding is a manufacturing problem.

Probably a great deal of the haziness which surrounds cost accounting in the minds of otherwise capable executives, is due to the loose use of cost accounting terms. Inasmuch as it is my aim, in this series of articles, to make as clear as possible the principles involved in machine-shop cost accounting, I am going to assume that the reader knows nothing of cost accounting, and start by defining the terms we shall use throughout this series.

1. Material includes all matter which can be directly measured and identified as part of the finished product, such as castings and forgings.

2. Supplies include all matter which aids in the manufacture but is not apparent directly in the finished product. Example—files, oil, belting, brooms, etc.

In one sense, of course, both "material" and "supplies" are material, but for the sake of nomenclature we shall separate them as above.

XI. The Fundamentals of Cost

Having surveyed the generalities of cost systems in Part X of this series, the author here gets down to practical details. He gives the fundamental definitions and explanations of cost subdivision and includes practical bookkeeping suggestions.

(Part X appeared in the October 14 issue.)

3. Productive labor is that labor which can definitely be charged to the cost of making or assembling some finished part or assembly.

4. Non-productive labor is that labor which cannot be directly charged to a definite finished part or assembly. For example—janitors, watchmen, truckers, foremen.

In a way, perhaps, the use of the word "productive" and "non-productive" carries an unfair implication. Accountants are apt to refer to the two classes as direct and indirect labor. In the shop, however, the terms "productive" and "non-productive" are most common, and it is my aim to use such expressions as will tie in most closely with the common language of the shop.

5. Expense includes all items of cost which cannot be directly traced in the finished product, but which are necessary to maintain, shelter, instruct, direct or otherwise aid productive labor to produce and the sales department to sell.

Expense is sometimes called overhead or burden. There are no objections to the use of either of these terms, but it is my belief that the word expense is the one most commonly used.

6. Expense is commonly divided into two headings—factory expense, which covers those intangible items that aid production, and—

7. Selling expense, which includes all items of cost that directly or indirectly aid in distributing and selling of the product.

Certain items are sometimes difficult to assign to one or the other of these two divisions of expense. The test is this: If your product required no selling effort, if the customer came to the finished stockroom and removed the product, would this item of expense be incurred? If so, it is a factory expense; if not, it is a selling expense. In other words, the finished stockroom is the dividing line between factory expense and selling expense.

Elements of Cost Accounting

In the articles of this series which are to follow, we shall discuss the detailed methods of gathering all of the above factors of costs. At present, our only aim is to give the reader somewhat of a bird's-eye view of the subject and perhaps to clarify some of the complications which otherwise might confuse the man who is unaccustomed to solving cost problems.

My experience is that one of the most confusing things to a majority of manufacturers is the fact that oftentimes labor or materials which ordinarily are productive, finally find their way into the finished product as non-productive. For instance, the mere physical appearance of a piece of raw material is not the criterion as to whether it is productive material or a supply. It is the use to which it is put which determines how it shall show in the costs. A piece of bar steel may be either an expense or a productive item, according to the use to which it is put. Suppose that your finished product consists of an assembly containing gears. You carry a stock of bar steel from which the gear blanks are cut. The bar steel used in this way is obviously productive material. But suppose you have a repair to make for one of your machine tools. You may draw out the bar steel originally intended to be sold as part of your regular product and use it to manufacture a gear for your broken machine tool. This gear, and consequently the bar steel from which it was made, would thus not be charged into the goods in process account or to an article sold, but would be charged to expense. It would appear ultimately on the expense analysis as material used for machinery and repairs. That is a typical example of how productive materials may become expense.

Perhaps it may seem advisable, instead of buying a machine tool from an outside manufacturer, to manufacture the tool in your own shop. If so, this piece of bar steel would find its resting place in the fixed asset account.

Aside from getting accurate costs, it is important in these days of high taxes, to get the correct disposition of various materials used, for incorrect reporting may result in a considerable difference in the tax statement at the end of the year.

It is likewise with labor. It is seldom possible to assume that any given man is a productive or a non-productive worker. Rather is it necessary to analyze the activity of each man by means of his time tickets in order to determine from the statement of his activity whether his work was productive or non-productive. A man's regular occupation may be operating a milling machine on productive work, but he may be temporarily withdrawn from productive work and set to work for a few hours on a part which will be used to repair some machine. That man will have done, in the same day, both productive and non-productive work, and it is necessary to divide his time justly between the two jobs. If this same workman, instead of being put on repair work were, at a time when orders were slack, put upon operations necessary to building a machine tool for the shop, his labor would, like the material, end up as a fixed asset, and the cost of his time would ultimately appear on the equipment register. The nature of his work, whether productive or non-productive, would also determine whether a part of the expense of the department in which he worked should be carried to the goods in process account or to the fixed asset account. The point I wish to emphasize is that no one can say beforehand that the work of a given man, or that a given kind of material, is necessarily productive or non-productive. This can only be determined by the use to which it is put.

Knowledge of Plant Processes Necessary

Perhaps this makes clearer why I insist that correct cost accounting must be based on an accurate and comprehensive knowledge of the processes involved in the plant.

Because it is not always so easy to say just how an element of cost is to be gotten into the finished product, we frequently find manufacturers, when in doubt about an item, saying: "Oh! throw it into the overhead." That is a sign either of mental laziness or of a failure to grasp the fundamentals of cost accounting. Because there is bound to be a certain amount of approximation involved in distributing the expense to the product, the aim should rather be to get as many items of cost as possible charged directly to the proper unit of output. This is especially true when more than one type or size of product is manufactured, which is almost universally the condition in machine shops. It is surprising to find how, upon careful study, many items which have always been considered expense can be allocated directly to the proper product. All items of expenditure will, of course, ultimately come into the product, and it is always more accurate to charge them directly than by percentages.

CHARGE REGISTER

№	MONTH 1920	CREDITOR	ACCOUNTS PAYABLE CREDIT	DATE PAID	MATERIAL AND SUPPLIES: CASTINGS AND FORGINGS	BAR STOCK	IRON AND STEEL	HARDENING AND CARBONIZING	LUMBER AND PACK'G MAT'L	MATERIAL PURCHASED FINISHED
		AMOUNT BROUGHT FORWARD								
00	1/2	Jones Lamphier Steel Co	1636 00			1000 00				
01	1/2	Russell Electric Co	76 22							
02	1/3	General Supply Co	123 28							
03	1/5	Carbon Fuel Co	892 29							
04	1/5	Barry Bearing Co	47 00							
05	1/6	Rockford Milling Machine Co	1525 28							
06	1/7	Post Roll	1592 54							
07	1/8	Red Oak Lumber Co	683 00						683 00	
08	1/9	New Departure Bearing	1391 00							1391 00
09	1/10	Drop Forge	927 50		927 50					
10	1/10	Steel Supply Co	13 50			13 50				
11	1/11	Chem Supply Co	923 00					923 00		
12	1/12	City Mach Co	47 00							
13	1/12	Pa Gulf Pipe	1225 12							
14	1/13	International Coke Co	72 50							
15	1/14	A J Smith Mfg	15 00							
16	1/16	Acme Mach Co	731 00							
17	1/17	Edison Electric Light Co	1375 25							
18	1/18	James Smith	1525 00							
19	1/21	American Machine	5 00							
20	1/19	Keeler-American Planing Co	29 00							
21	1/20	C Coal Co	297 00							
22	1/20	Motor Service Co	19 20							
23	1/26	General Supply Co	49 20							
24	1/27	Sun Machine Co	1372 20							
25	1/25	B & O Co	75 00							
26										
27										
28										
29										
30										
31										
		AMOUNT FORWARDED								
		TOTAL	2709 27		927 50	1013 50		923 00	683 00	1391 00

SUMMARY FOR LEDGER POSTING

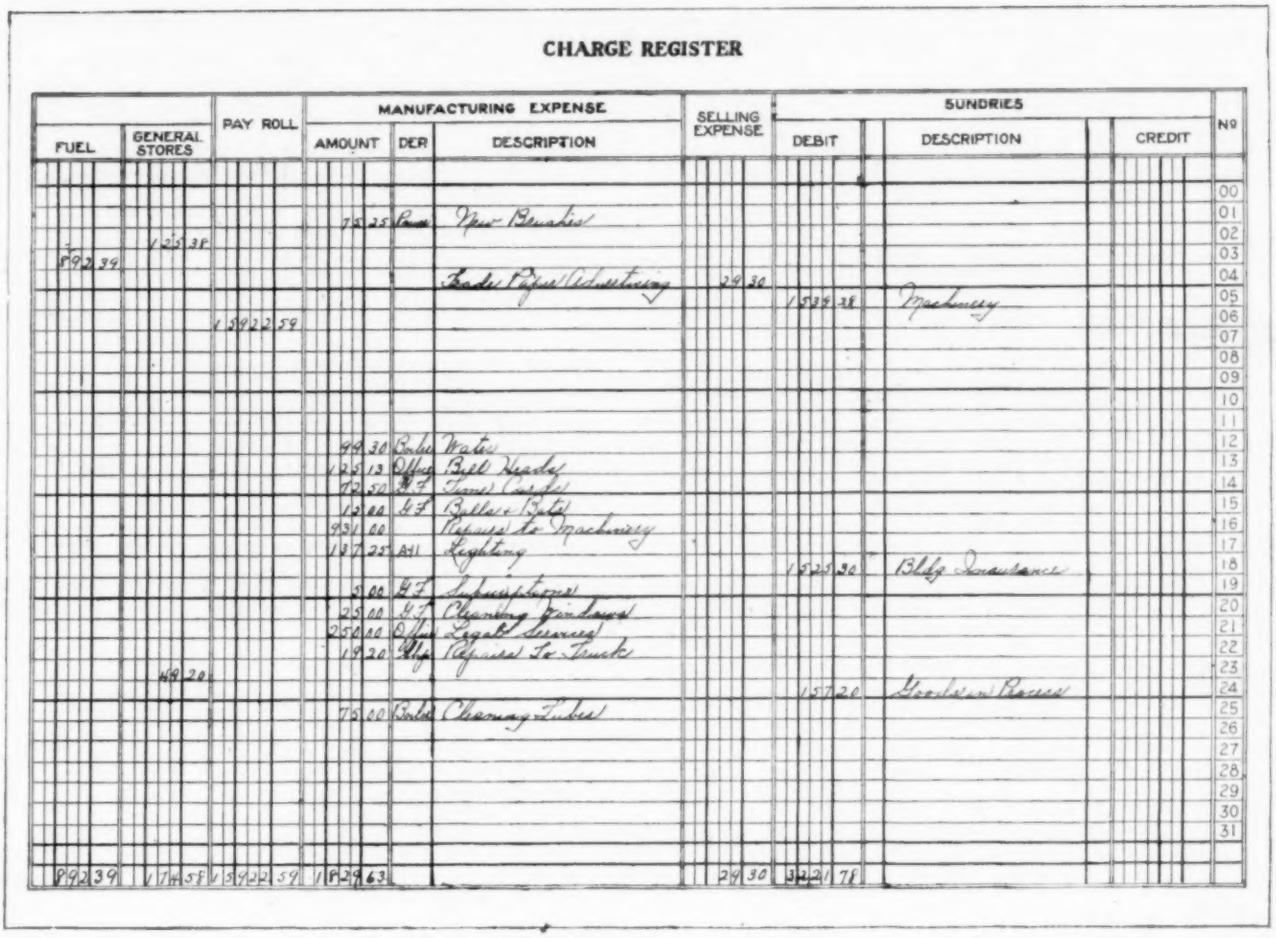
	Dr	Cr
Ledger Accounts		
Accounts Payable		2709 27
Castings & Forgings	927 50	
Bar Stock	1013 50	
Hardening & Carbonizing	923 00	
Lumber & Pack Mat'l	683 00	
Material Purchased Finished	1391 00	
Fuel	892 29	
General Stores	174 58	
Pay Roll	1592 54	
Mfg Expense	1823 63	
Selling Expense	29 30	
Machinery	1539 28	
Bldg Maintenance	1523 30	
Works Manager's Office	157 20	
TOTAL	12764 27	2709 27

FIG. 56. CHARGE REGISTER SAMPLE SHEETS (FIRST HALF)

But good sense must govern the executive in his attempts along these lines—for instance, it is conceivably possible to allocate all power costs directly to the product turned out. Intricate calculations could be made, showing the number of horsepower hours required to turn the crankshaft in a lathe. The calculations getting all the time more and more intricate, could be carried back through the transmission system to the coal pile, taking into consideration the exact amount of lubricating oil, wear and tear on belting, and so on, caused by turning that particular crankshaft. Of course, it would be ridiculous on the face of it, to attempt such calculations. So to avoid excessive clerical expense, and avoid making ourselves ridiculous, we are satisfied to allocate power costs to the controlling section. We find out what the total cost of generating and transmitting power is; we then determine how much power each section or department uses and spread that charge over the production of that department. The detailed method of handling this subject of power will be discussed in another article. I am simply mentioning it to drive home the fact that while as a general rule we want to get as many items as possible out of expense and into the product direct, we still are governed by the rule that the result must be worth the effort, which it would not be if we were to follow the theoretically possible methods of getting the charge for coal directly into the product.

It has probably occurred to most readers while we have been discussing the nature of overhead expense, that all of the elements of overhead are not the same. For instance, the salary of the automatic machine department foreman can properly be spread over all of the production of the automatic machines. The oil and cutting compounds used for these machines are also properly chargeable to them, and to nothing else. It probably would not occur to anyone to charge any part of the salary of the automatic department foreman into the overhead of the foundry. But there are items of expense, which cannot be put directly into the overhead of any productive department. The superintendent's time, for instance, is taken up with supervision of both of these departments. He also probably gives some attention to the efficient operation of the power house. Therefore each of these departments should bear a part of this item of expense. How his salary is divided among the various departments will be discussed later. It is evident, however, that we can divide expense in two ways not previously noted. Some of it, in other words, is expense directly chargeable to a productive department, as is the case with the salary of the foreman of the automatic department. Other items of overhead, while not having a direct connection with the productive departments, are nevertheless necessary to the best functioning of the plant as a whole. Thus we consider power, for instance, as a contributory department, while the automatic machines would be the productive department.

Earlier in this article it was noted that the elements which go to make up the cost of the product may either be actual cash expense or merely book entries. We thus find that expense is of three general sorts—



CHARGE REGISTER

FUEL	GENERAL STORES	PAY ROLL	MANUFACTURING EXPENSE AMOUNT	DEP	DESCRIPTION	SELLING EXPENSE	SUNDRIES DEBIT	DESCRIPTION	CREDIT	№
			75 25	Power	Mun Benefits					00
	1 26 38									01
592 39										02
					Ladies Rajus Adventures	29 30				03
							1529 38	Machinery		04
		1 5922 59								05
										06
										07
										08
										09
			49 30	Boiler	Water					10
			125 13	Office	Bell Heads					11
			72 50	G F	Time Cards					12
			12 00	G F	Ballance Safes					13
			931 00		Repairs to Machinery					14
			187 25	All	Lighting					15
							1525 30	Bldg Insurance		16
			5 00	G F	Subscriptions					17
			25 00	G F	Cleaning Windows					18
			250 00	Office	Legal Services					19
			19 20	Office	Repairs to Truck					20
	49 20									21
							157 20	Goodwin Rogers		22
			75 00	Boiler	Chemung Tubes					23
										24
										25
										26
										27
										28
										29
										30
										31
892 39	1 74 58	1 5922 59	1 829 63			29 30	3221 78			

FIG. 56. CHARGE REGISTER SAMPLE SHEETS (SECOND H\LF)

1. The charges to the productive manufacturing departments which arise in those parts of the factory that actually work upon the product of the plant. These expense items are, however, of such a character that they cannot be charged directly into a particular product. They consist of such items as supplies, non-productive labor, foreman's salaries, etc. These charges vary roughly with the activity of the plant and are therefore sometimes referred to as controllable expense. In other words, if the plant were shut down or its activity greatly curtailed, there would be a corresponding falling off in the amount of these charges unless it happened to be the policy of the company to maintain all or a skeleton of its organization in bad times.

2. The charges against the contributory departments also vary, but not so closely with the activity of the plant. These charges are for the benefit of the factory as a whole. Chief among them are the executives' salaries, superintendents' salaries, office expense, heat, light and power, the upkeep of the stockroom, the receiving room, the shipping room, etc.

3. The fixed charges, so-called because they go on regardless of the activity of the plant and normally do not vary much from year to year unless considerable additions are made to the plant or the equipment. They are spread over the entire plant and consist of such items as rent, insurance, taxes, depreciation, etc. Obviously some of these items will appear or not, depending upon whether the plant is rented or owned.

Numerically, by far the greater number of the elements of cost which must ultimately get into the cost of the finished product, are the actual expenditures. Money is actually paid out for all materials, supplies, labor and all of the expense of overhead items except depreciation. Depreciation is calculated from what is known as a fixed charge sheet. The method of determining these charges will be described in the next article.

The Charge Register

However, it is necessary for us to have some routine by which we will be assured that all actual disbursements will find their way into the costs. For this purpose we shall use the charge register shown in Fig. 56. This form is a rather modern development in bookkeeping which greatly simplifies both the bookkeeping and the cost accounting. The form is ruled to conform with the four principal elements of cost, namely—materials, and supplies; labor; factory expense; and selling expense. The exact form of the register will, of course, depend upon the nature, extent and needs of the business. Sometimes the executive who becomes over-enthusiastic on costs, tries to minutely subdivide the headings of the charge register. I recall one man of the sort who insisted that his charge register be designed to permit a distribution among 130 accounts. This necessitated a most unwieldly book, and with all the subdivisions, was no more valuable than one with the four principal headings given above and shown in the figure. Such a book as this need have a page no more than 24 in. wide. The complex manufacturing business cannot possibly devise a charge register sufficiently subdivided to hold all the details which are needed by the cost department.

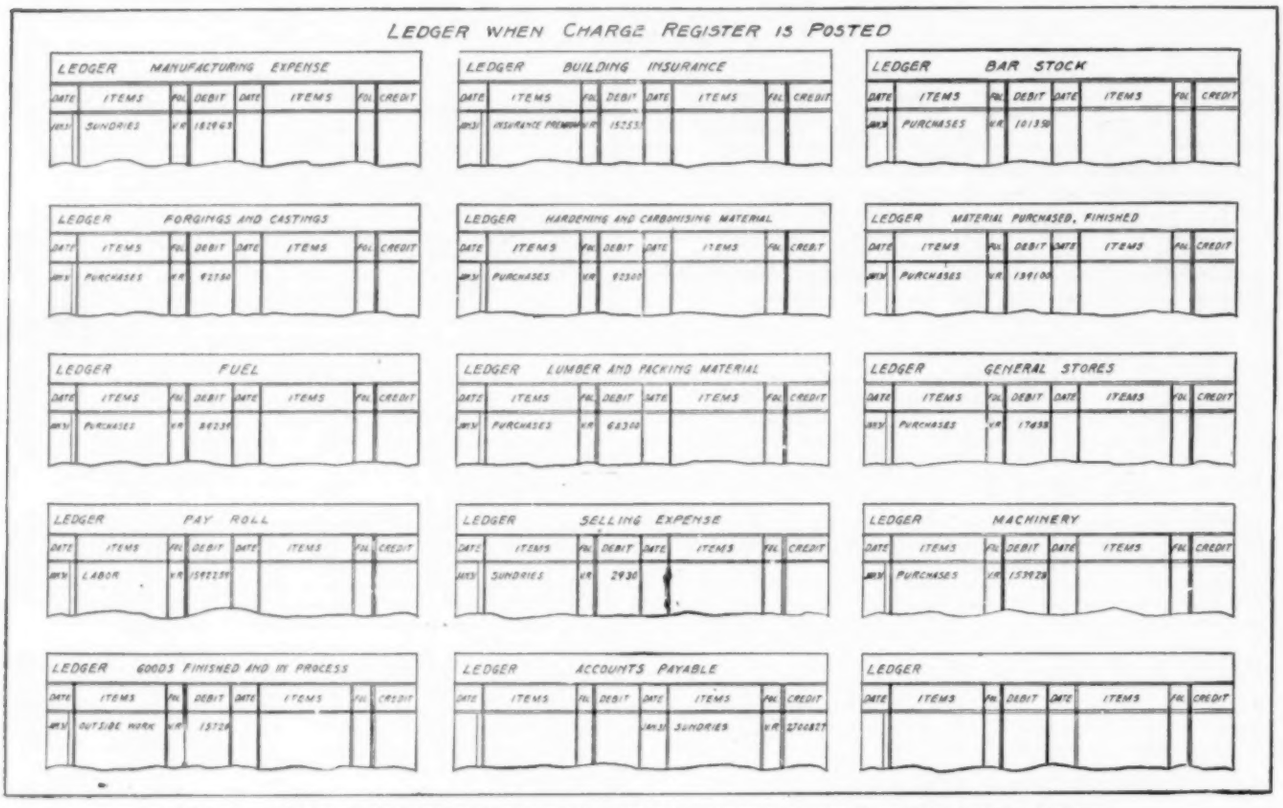


FIG. 57. SAMPLE LEDGER PAGES AFTER CHARGE RECORD ITEMS HAVE BEEN POSTED

In fact, I prefer to consider the charge register as a controlling account with broad subdivisions, and spaces left so that each item under these broad divisions can be described. In this way it is possible to analyze the items so that they will get accurately and safely to their ultimate destination. There are a great many machine shops whose conditions are such that 500 columns on a charge register would not suffice, but the four broad classifications will do.

The function of the charge register is thus seen to be that of a narrow channel through which all disbursements must pass. Because the channel is narrow, giving a close view of each item, it is possible to segregate them among the principal controlling accounts of the business, which is all that is needed at this point. In later articles we shall trace the entries on the charge register which we have reproduced, through the various steps that they take en route to their final resting place in the cost of the finished product.

The items shown on this page from the charge register are by no means all that would be entered in the course of a month in even a small business. They are meant to be typical only. All are self explanatory, I think, except perhaps that one on line 24, from the Sun Machine Co., for $154.25, an invoice for work which the Sun Machine Co. did on the product to relieve a congestion in the shop. The charge will become part of the direct cost of the part in question. The item is therefore charged directly through the charge register to the goods finished and in process account.

At the end of the month the columns of the charge register are footed and a summary is prepared such as is shown at the bottom of the charge register. As columns are maintained for each ledger account, with the exception of the general ledger debit column, no analysis of the various columns has to be made, with the exception of the general column. This should be analyzed and the amount debited to each account accumulated and shown separately in a summary, as is indicated on that which we have herewith attached.

Fig. 57 shows the various ledger pages of the general books after the items on the charge register have been grouped and posted. This is the first point at which the cost system "hooks up with the general books."

It has been my aim, in this article, merely to make clear the fundamental principles governing cost accounting. The ones I have discussed are those where executives most often go astray. It is my belief that if an executive once gets a clear grasp of these fundamentals the minor intricacies will present no difficulties.

Cost systems are seldom inaccurate because of the routine and forms used. The inaccuracies come from fundamental errors; often due to considering the subject from an accounting standpoint rather than as a manufacturing problem.

The devising of a cost system presents a series of manufacturing problems, each of which must be solved in the light of the needs and conditions of the particular business. Designing a cost system is entirely comparable to designing a bridge. There is no standard bridge which can be thrown across all streams. The nature of the ground on which the foundations will rest must be studied and the problems presented by quicksand or rock solved.

The amount and nature of the load to be carried must also be known, as a bridge is designed especially to support those loads.

In the same way, the peculiarities of the product, of plant layout and even of the personnel must be considered in designing the best cost system for any plant.

Duralumin*

It has been said that the steel age in which we have lived for the last generation will be followed by the aluminum age. Recent developments in aluminum alloys seem to indicate that the transition from steel to aluminum may possibly be at hand. Among the most important is "duralumin," which has been used in airship and airplane construction by the Germans. We offer here a translation of an article describing its composition and properties.

THE use of duralumin in the construction of aircraft renders an account of the properties of this material desirable especially with reference to its working qualities as developed by experience.

Duralumin is made in various compositions and has, with the exception of small quantities of impurities, the following composition:

	Per Cent
Aluminum	95.5 to 93.2
Magnesium	0.5
Copper	3.5 to 5.5
Manganese	0.5 to 0.8

Lead, tin and zinc which, as is well known, have an unfavorable influence upon the permanence of aluminum alloys are not found in duralumin. The specific gravity of duralumin varies according to composition and hardness from 2.75 to 2.84. The melting point is about 650 deg. C. (1,202 deg. F.).

Like other metals, duralumin can be rolled into plates and shapes and behaves in a similar manner, in that the elongation decreases as the hardness of rolling increases. Tube blanks, however, can be made only by pressing and not by the oblique rolling method.

*From a translation by Starr Truscott of an article appearing in the *Technische Berichte*, Vol. III, Sec. 6. The translation has been published by the National Advisory Committee for Aeronautics as one of its Technical Notes. Mr. Truscott, who is a member of the Society, is an aeronautic engineer in the Bureau of Construction and Repair, Navy Department, Washington. We are indebted to the Society of Automotive Engineers for the cuts.

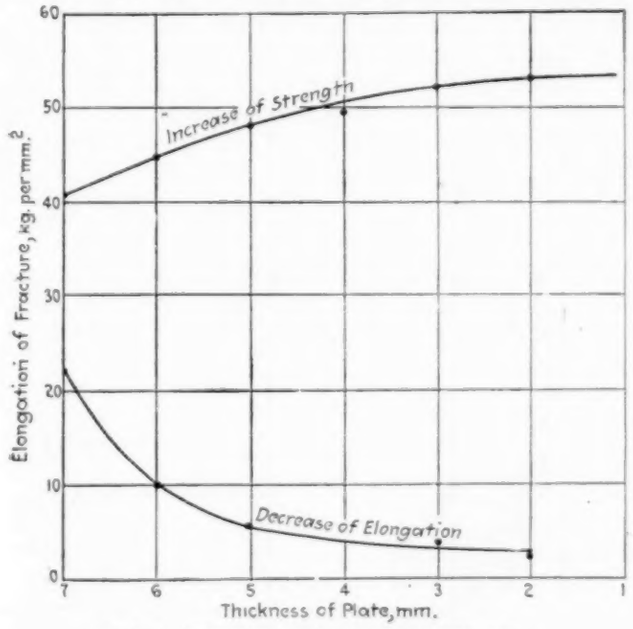


FIG. 1. EFFECT OF COLD ROLLING ON A DURALUMIN PLATE

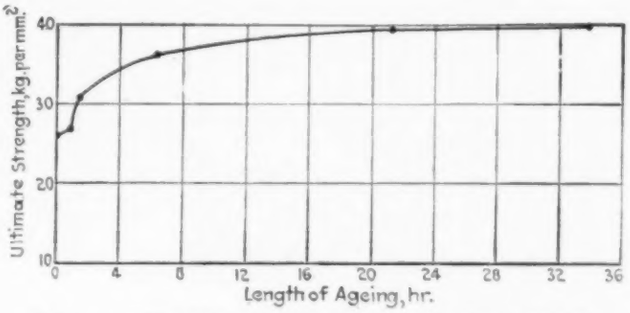


FIG. 2. INCREASE OF STRENGTH DURING AGEING

Fig. 1 shows the increase in tensile strength and decrease in elongation of a duralumin plate as its thickness is reduced by cold rolling from 7 to 2 mm. The strength increases from 41 to about 54 kg. per square millimeter, while the elongation falls from 22.7 to 2.3 per cent. The curve shows that the elongation decreases very rapidly with the very first reduction in thickness. However, duralumin can be worked hot at a temperature of about 400 deg. C. (752 deg. F.) very well.

Duralumin can be tempered, like steel, by heating and suddenly cooling. For this purpose plates, tubes, and shapes are heated to between 480 to 510 deg. C. (896 and 950 deg. F.) and quenched, then aged; that is, the treated material is simply set aside. The original strength characteristics are very nearly restored after the quenching but the tensile strength continues to grow with the time of ageing, from 35 to 50 kg. per square millimeter. The elongation does not decrease but remains at least the same and usually increases slightly. In practice the greatest strength is reached after about five days of ageing.

When heated to over 530 deg. C. (986 deg. F.) duralumin becomes unusable. Consequently the treating is carried on in a bath of nitrates whose temperature can be carefully regulated and watched. During the ageing of the metal work cannot be done on it which would change the section, as in that case the strength will not increase further. After the completion of ageing, the material can be rerolled to obtain smooth surfaces. The strength is thereby increased at the expense of elongation.

Fig. 2 shows the increase of strength during ageing. The tensile strengths were determined by the Ericson test with 0.385 as a coefficient. This value was obtained

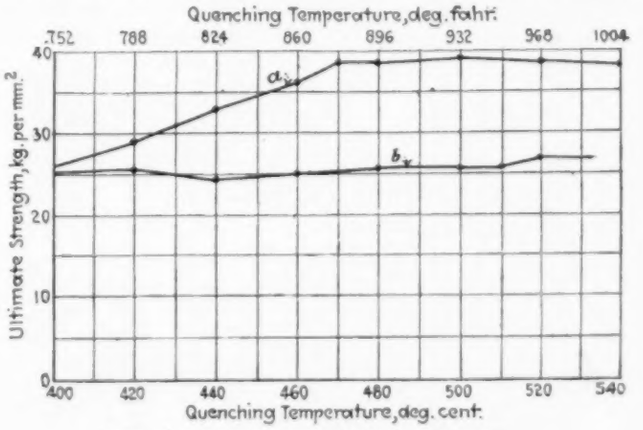


FIG. 3. QUENCHING TEMPERATURE—STRENGTH CURVES

TABLE I. STRENGTH FIGURES OF DURALUMIN COMPOSITIONS

Symbol for Composition	Condition	Method of Preparing	Elastic Limit, Kg. per Sq.Mm.	Tensile Strength, Kg. per Sq.Mm.	Elongation, per Cent	Modulus of Elasticity, Kg. per Sq.Cm.	Sections Available
681b	Tempered only	Tempered	24 to 26	38 to 40	20	About 500,000	Tubes, plates, strips, bars and shapes.
	½ hard	Tempered and cold rolled	30	40 to 42	16 to 14	500,000	Tubes, plates, strips and bars.
681a	Tempered only	Tempered	25 to 27	38 to 40	20 to 18	600,000	Tubes, plates strips, bars and shapes.
	Hard	Tempered and cold rolled	30 to 32	44 to 46	11 to 10		
681h	Tempered only	Tempered	26 to 28	38 to 42	18 to 15	600,000	Tubes, plates, strips and bars.
	Hard	Tempered and cold rolled	32 to 34	45 to 48	11 to 10		
N	Tempered only	Forged rivets are tempered	20	32 to 34	18 to 14	Shear strength up to 6-mm. diameter 25 kg. per sq.mm.	Finished rivets.

from the experiments described below. Experiments have been made (see Fig. 3) by the Durener-Metallwerke to determine the most favorable quenching temperature. The curve *a* shows the variation in the strength of duralumin which had been aged for four days with the variation of quenching temperature. Curve *b* shows the strength immediately after the quenching. The strengths were determined in both cases by the Ericson test. As the material may warp in tempering it is not good practice to temper riveted parts. Such parts should be tempered before they are riveted.

Strength Properties

Duralumin is delivered in various compositions which have different properties according to the purpose for which it is intended to be used. It is therefore important that the concern supplying the material should be informed regarding the nature of the working proposed. In Table I below are assembled the strength figures of some duralumin compositions made by the Durener-Metallwerke.

The modulus of elasticity of the hard composition 681a was found by the Technischen Hochschule Aachen to be 700,000 kg. per square centimeter. Making allowance for the possible effect of vibration on the modulus of elasticity it appears better to use not more than 650,000 kg. per square centimeter in computations.

In judging as to the suitability of a material for use in stressed parts not only the tensile strength but also the ductility is of great importance. This can be determined by bending strips backward and forward through 180 deg. over a definite radius, usually 5 to 10 mm., the number of bends before fracture being taken as a measure. Other conclusions as to the ductility can be obtained from the Ericson test (see Fig. 4). The plate to be tested is pressed through a ring, *b*, by a head, *a*, until a tear shows on the upper surface of the sheet. The depth of the impression is then a measure of the ductility.

In Table II there are compared strength values, numbers of bends over 5-mm. radius and through 180 deg., and depths of impression as observed on Bergmetall and steel plates of equal thicknesses. Although the strength values of the latter are less than those of the duralumin plates, nevertheless one can compare the figures as to number of bends and depths of impression without correction, since it is possible to obtain steel plate with a higher strength which also possesses great ductility.

The number of bends (see curves at the left of Fig. 5) for both metals decreases with increased thickness. For steel, however, they lie considerably higher than for duralumin. The difference is least for plates under 0.5 mm. in thickness. For thicker plates of duralumin

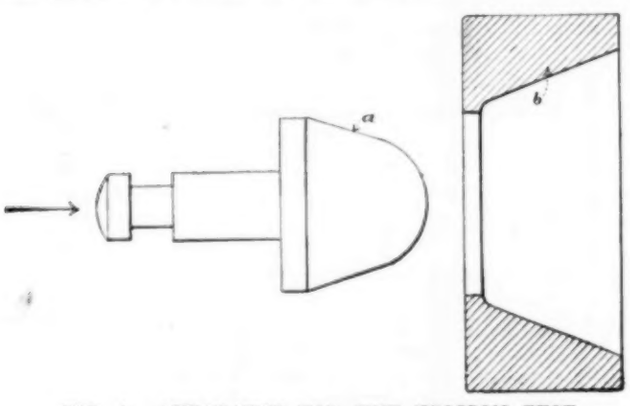


FIG. 4. APPARATUS FOR THE ERICSON TEST

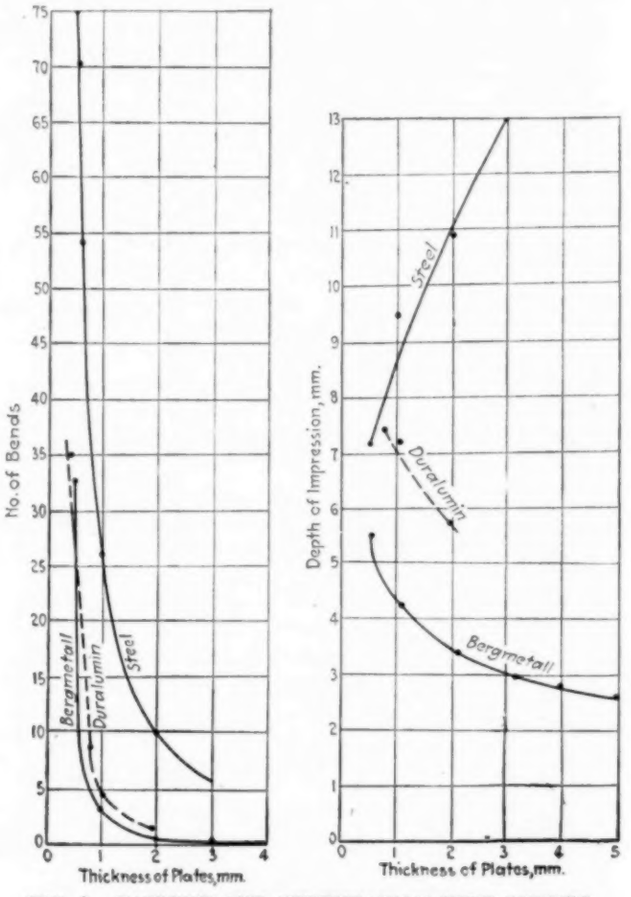


FIG. 5. FATIGUE AND INDENTATION TEST CURVES

TABLE II. COMPARISON OF STEEL AND BERGMETALL

Steel					Bergmetall			
Thickness of Plate, Mm.	Strength, Kg. per Sq.Mm.	Elongation, per Cent	No. of Bends	Depth of Impression, Mm.	Strength, Kg. per Sq.Mm.	Elongation, per Cent	No. of Bends	Depth of Impression, Mm.
0.5	36	10.5	76	7.2	47	10.5	33	5.5
1.0	34	15.3	26	95.0	47	11.0	3	4.2
2.0	39	12.0	10	10.9	45	11.0	Fractured at 90 deg.	3.4
3.0	40	17.7	6	13.0	48	14.1	Fractured at 60 deg.	3.0
4.0	..	..	..	..	48	9.7	Fractured at 45 deg.	2.8

the number of bends decreases very rapidly. A plate 2 mm. thick breaks over a 90-deg bend; a plate 4 mm. thick over a 45-deg. bend. From these results duralumin might be referred to as "cold short" for thicknesses greater than 1 mm. This property makes it unsuitable for highly stressed parts which must at the same time withstand vibrations. This is of prime importance in connection with the bent lug plates which are ordinarily used in aircraft for taking wire terminals. In these lugs vibrations undoubtedly occur during flight which would reduce the strength of the duralumin and might cause sudden fracture. Exactly how vibrations influence the modulus of elasticity has not yet been determined, although experiments along this line are already under way.

A comparison of the depth of impression of steel and duralumin from the curves at the right of Fig. 5 shows that for steel the depth of impression increases with the thickness of the material, while for duralumin it decreases. As a result of a peculiarity of the testing machine used the greatest stress occurred at a point which was from 5 to 6 mm. from the vertex of the depression. In this locality the material began to flow before cracking. It is obvious that thick plates of ductile material may be stretched more easily on the upper surfaces and consequently deeper impressions obtained than with thin plates, since for thick plates more material can flow before fracture occurs. A similar course of reasoning can be used to explain the decrease of the depth of the impression with an increasing thickness of plate in the case of material of less ductility. On the upper surface of the test-pieces there occur high tensile stresses at the point mentioned, which increase with the strength of the plate. As the material flows only to a small degree, cracks very soon appear and extend into the interior. The process described can be followed on the sections of a steel plate of about 40 kg. per square millimeter strength and a duralumin plate, shown at the left of Fig. 6. The flow before fracture of the steel plate is plainly recognizable while the duralumin plate shows hardly a sign of it. The right half of this illustration shows

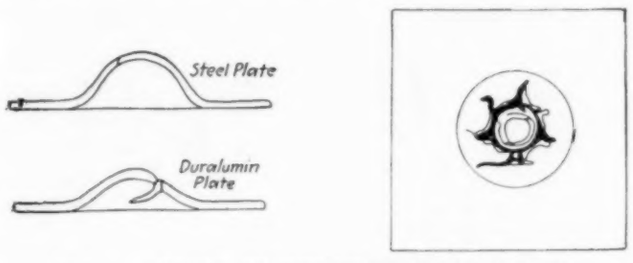


FIG. 6. RESULT OF INDENTATION TO FAILURE

TABLE III. INFLUENCE OF COLD ON THE STRENGTH OF DURALUMIN

Testing Temperature, Deg.C.	Deg. F.	The Bar Was Tested in	Limit of Stretch and Strain	Tensile Tests Ultimate Strength, Kg. per Sq.Mm.	Elongation, per Cent	Impact Test, Work of Breaking, Kg. per Sq.Mm.
+ 20	+ 68	Air	24.0	42.5	21.9	2.6
0	+ 32	Snow	23.6	43.0	21.8	2.6
— 20	— 4	Mixture of snow and table salt	24.0	43.7	23.1	2.7
— 40	— 40	Mixture of snow and calcium chloride	24.0	44.0	22.1	2.7
— 80	—112	CO_2 snow	25.2	44.4	22.7	2.7
—190	—310	Liquid air	32.3	53.7	28.7	2.6
+ 20	+ 68	Air	23.0	42.3	23.3	2.6

the appearance of a test sample of strong duralumin plate after fracture in which the material suddenly split in all directions. For flanging and pressing tempered duralumin is consequently suitable only in the thin gages.

Influence of Heat and Cold

Heat has an important influence on the strength of duralumin. According to the results obtained in tests by the Central Bureau for Scientific Investigation, Neubabelsberg, when heated the strength decreases 10 per cent for an increase in temperature of 100 deg. C. (212 deg. F.) and about 20 per cent for an increase of 150 deg. C. (302 deg. F.) (see Fig. 7). The loss in strength increases with the increase of temperature. The elongation increases on first heating to a hardly appreciable extent, while between 150 to 200 deg. C. (302 and 392 deg. F.) it decreases. At 250 deg. C. (482 deg. F.) the elongation becomes the same as at room temperature. With further heating the elongation increases with a rising temperature. Consequently wherever duralumin is exposed to heat the possible decrease of strength must always be considered.

As opposed to this the influence of cooling on the strength properties is less unfavorable. The Central Bureau for Scientific Investigation has made tests on this also (see Table III). The strength and elongation increase somewhat with the decrease in temperature. The work represented by the blow in the impact tests is not decreased when material is affected by cold so that one can safely assume that the cold encountered in flight has no unfavorable influence on duralumin.

Experiments on the influence of weathering on the strength of duralumin, which have been carried on by the Durener-Metallwerke for three years, have shown that no observable decrease in the strength properties can be noticed (see Table IV).

The Durener-Metallwerke has also carried on for about a year experiments on the influence of the elec-

TABLE IV. EFFECT OF WEATHERING ON THE STRENGTH OF DURALUMIN

	Dec., 1909		Nov., 1910		Nov., 1911		Dec., 1912	
Testing Data Alloy 681a	Strength, Kg. per Sq.Mm.	Elongation, per Cent	Strength, Kg. per Sq.Mm.	Elongation, per Cent	Strength, Kg. per Sq.Mm.	Elongation, per Cent	Strength, Kg. per Sq.Mm.	Elongation per Cent
Round Bar	41.7	20.0	42.2	21.0	42.0	21.1	42.9	18.3
Bar (thick)	39.1	20.0	38.7	19.6	39.3	18.9	40.0	20.0
Bar (thin)	42.0	20.0	39.1	18.0	39.3	18.0	42.3	16.5
Wire (thick)	48.0	20.1	45.0	20.1	44.3	19.7	44.5	19.8
Wire (thin)	46.3	20.0	44.0	19.6	42.5	18.7	43.2	18.5

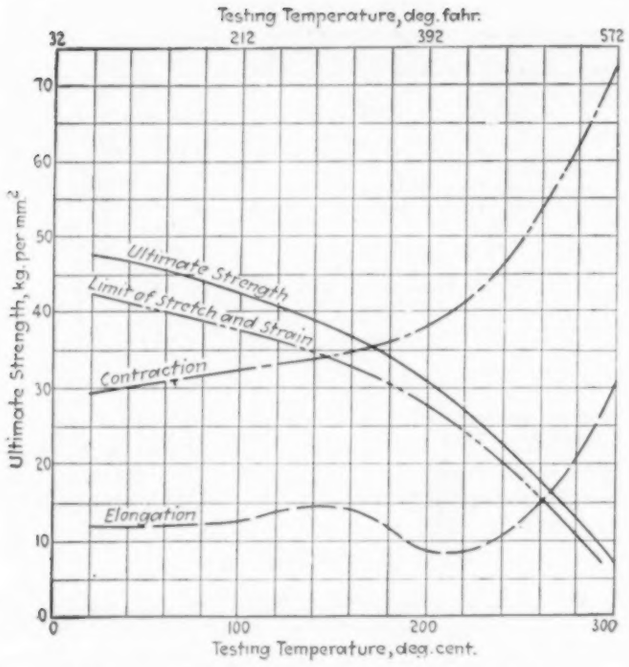


FIG. 7. EFFECT OF HEATING DURALUMIN

trolytic effect from junctions of duralumin with iron or steel. These were made by riveting duralumin bars to iron plates and then placing them in artificial sea water. There resulted only an insignificant destruction of the iron and a reduction in weight of the bars of about 0.23 per cent so that no considerations exist against the use of duralumin and iron junctions in aircraft.

CONCLUSIONS

Duralumin has a strength of 35 to 40 kg. per square millimeter and an elongation of 10 to 15 per cent. The stretching strain limit lies very high, about 28 to 32 kg. per square meter. The modulus of elasticity is about 600,000 to 700,000 kg. per square centimeter. It is very brittle especially in thicknesses above 1 mm. and consequently sensitive to alternate bending to and fro.

Bent plate fittings, with bent lugs which must resist vibration, are best not made out of duralumin but of sheet steel. For stressed parts which while in flight are exposed to an increase in temperature of more than 100 deg. C. (212 deg. F.) the use of duralumin is objectionable unless a correspondingly smaller strength value is used in computations. Cold has no harmful influence on duralumin. The joint between iron and steel and duralumin can be made without electrolytic action occurring. Pieces, which for better working must be heated, must be in all cases retempered after completion.

A Centering Device for the Milling Machine

BY R. H. KASPER

A large number of pieces were to be grooved through the center with a circular cutter on the milling machine. Accurate centering was essential. These pieces were found to vary slightly in width, making accurate centering an expensive job, owing to the time consumed in measuring. To overcome this difficulty, the device shown in Fig. 1 was designed, and gave such perfect satisfaction as to make its use almost a necessity.

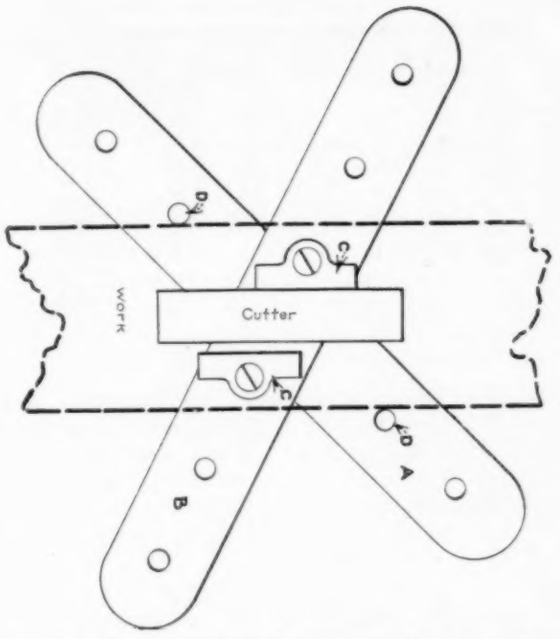


FIG. 1. DEVICE FOR CENTERING WORK ON THE MILLING MACHINE

This device consists of a bar *A* which carries another bar *B*, and this in turn carries the two swinging members *C*. The swinging members *C* are free to turn on their studs, while bar *B* is free to swing on its stud in the center. Bar *A* carries two pins *D* which are screwed into holes equally distanced on both sides of the center. Bar *B* is likewise provided with screw holes for the studs carrying the swinging members *C*. The working faces of the swinging members *C* are ground so that they will both be the same distance from the center of their respective studs.

The method of using the device is shown in Fig. 2. In this sketch, the cutter arbor and overhanging arm are omitted for the sake of clearness. The bar *A* is placed on the work so that the pins *D* bear against opposite sides of the work. Bar *B* is then swung around so that one or both swinging members *C* come in contact with the sides of the cutter. If both swinging members *C* touch the cutter, the cutter is central with the work. It will be seen that if one swinging member lies against the cutter while the other is free to swing, the cutter is not over the center of the work.

This device has also been found useful for setting work to cut grooves a specified distance off center. This is done by placing a plate in front of the working face of one swinging member. The thickness of the plate should equal twice the required distance. For example: If a plate $\frac{1}{8}$ in. thick is used, the cutter will be set $\frac{1}{16}$ in. off center.

This device not only speeds up production but it also eliminates the possibility of mistakes in measuring, which are bound to occur occasionally in large orders.

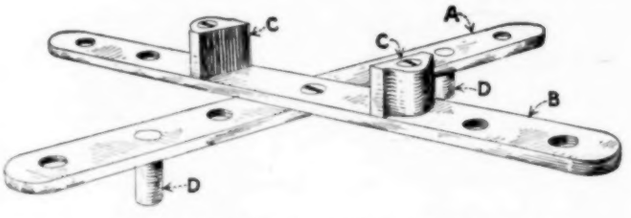
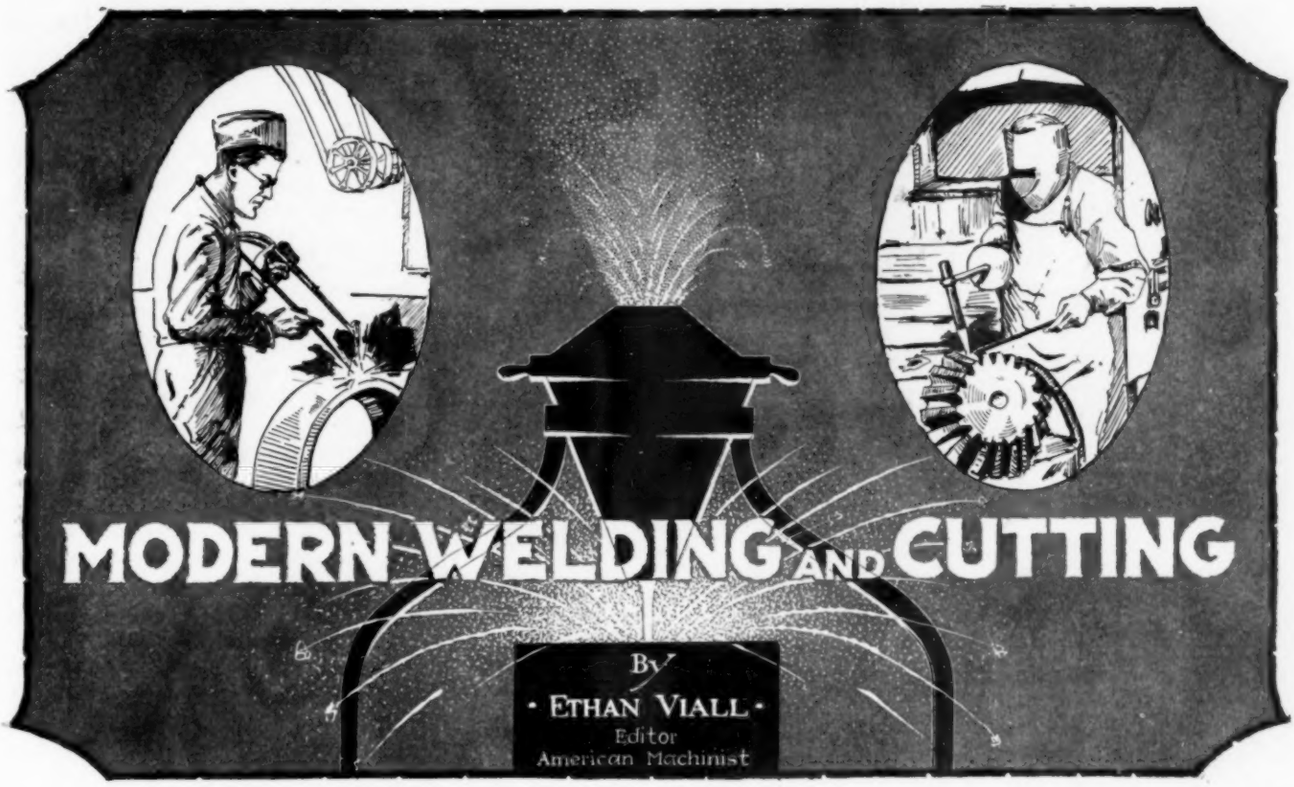


FIG. 2. METHOD OF USING THE DEVICE



Spot welding offers many opportunities to the maker of sheet metal, wire or other goods. It is also proving of great value in heavy steel construction work. This is the final article of the series; it deals principally with the various machines, although numerous examples of work are shown.

(Part XXX was published in last week's issue.)

XXXI. Spot Welding Machines and Work*

SPOT welding, as the name indicates, is simply welding in spots. Two or more overlapping metal plates or sheets may be welded together at intervals, by confining electric current to a small area of passage by means of suitable electrodes, or "dies" which are pressed against the metal from opposite sides. Spot welding is a form of resistance welding. Due to the way the metal is heated and forced together no oxidizing takes place, and in consequence no flux of any kind is needed.

While the process of spot welding is more commonly used at present for welding thin sheet iron, steel or brass articles, practical machines have been made for welding two pieces of ¾-in. ship plate together. Experimental machines have also been made capable of spot-welding three 1-in. plates together, and which can exert a pressure of 36 tons and have a current capacity of 100,000 amperes.

To weld soft cold-rolled steel in a satisfactory commercial manner, three conditions should be observed, if possible:

First, the surfaces to be welded should be free from rust, scale or dirt. If the work is not clean a higher secondary voltage will be required to penetrate through the scale or dirt of any given thickness of sheet. This means that a larger machine and more current must be used than would be required for clean stock of the same thickness.

Second, the sheets should be flat and in good contact at the spots to be welded, so that no great pressure is required to flatten down bulges or dents.

Third, the stock should not surround the lower horn, as in the case of welding the side seam of a can or pipe.

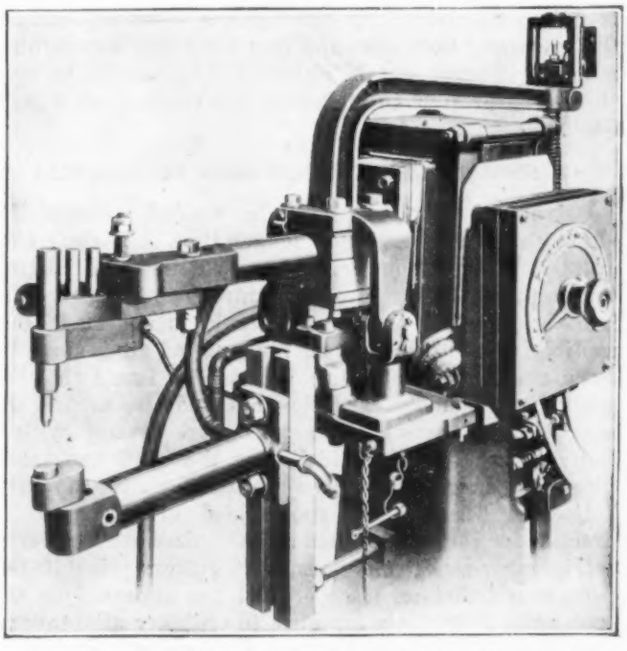


FIG. 391. TYPICAL CONSTRUCTION OF LIGHT SPOT-WELDING MACHINE

*For the author's forthcoming book "Welding and Cutting." All rights reserved.

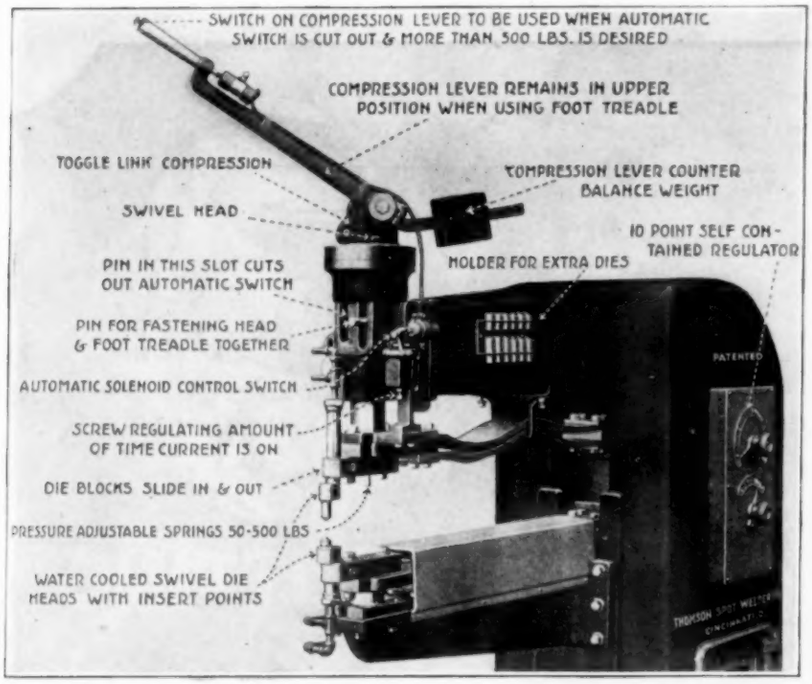

SWITCH ON COMPRESSION LEVER TO BE USED WHEN AUTOMATIC SWITCH IS CUT OUT & MORE THAN 500 LBS. IS DESIRED
COMPRESSION LEVER REMAINS IN UPPER POSITION WHEN USING FOOT TREADLE
TOGGLE LINK COMPRESSION
COMPRESSION LEVER COUNTER BALANCE WEIGHT
SWIVEL HEAD
10 POINT SELF CONTAINED REGULATOR
HOLDER FOR EXTRA DIES
PIN IN THIS SLOT CUTS OUT AUTOMATIC SWITCH
PIN FOR FASTENING HEAD & FOOT TREADLE TOGETHER
AUTOMATIC SOLENOID CONTROL SWITCH
SCREW REGULATING AMOUNT OF TIME CURRENT IS ON
DIE BLOCKS SLIDE IN & OUT
PRESSURE ADJUSTABLE SPRINGS 50-500 LBS
WATER COOLED SWIVEL DIE HEADS WITH INSERT POINTS
PATENTED
THOMSON SPOT WELDER CINCINNATI O

FIG. 392. SPOT-WELDING MACHINE FOR HEAVY WORK (PARTS NAMED)

It must not be understood that spot welding cannot be done except under the conditions outlined, for it can, but if the conditions named are not followed the cost of welding will be greater. However, it is often necessary to violate these conditions in actual manufacturing work. This is especially true of the third one. Where the lower horn must be surrounded by the work, as in welding can seams, the capacity of the machine is cut down because of the "induction effect" which tends to choke back the main current and in this way cuts down the heating effect at the die points. This so-called induction effect is only present when welding steel or iron, no such action being noticeable in welding brass.

Light gages of sheet metal can be welded to heavy gages or to solid bars of steel if the light-gage metal is not greater than the rated single sheet capacity of the machine. Soft steel and iron form the best welding material in sheet metals, although it is possible to weld sheet iron or steel to malleable-iron castings of a good quality.

Galvanized Iron Can Be Welded Successfully

Galvanized iron can also be welded successfully, although it takes a slightly longer time than clear iron or steel stock, in order to burn off the zinc coating before the weld can be made. Contrary to common opinion, the metal at the point of weld is not made susceptible to rust by this burning off of zinc, since by some electrochemical action it has been found that the spots directly under each die-point and also around the point of weld between the sheets, are covered with a thin coating of zinc oxide after the weld has taken place. This coating acts as a rust preventative to a very noticeable degree. On spot-welded articles used in practice for some time, such as galvanized road-culverts, refrigerator-racks and pans, rain-gutters, etc., it has been found that no trace of rust has appeared on the spot-welds from their exposure to ordinary atmospheric conditions. Extra light gages of galvanized iron below 28 B. & S. gage cannot be very successfully welded, due to the fact that so little of the iron is left after the zinc has been burnt off that the metal is very apt to burn through and leave a hole in the sheets.

Tinned sheet iron is ideal for welding, giving great strength at the weld, but the stock will be discolored over the area covered by the die-points. Sheet brass can be welded to brass or steel if it contains not more than 60 per cent copper. It is not practical to attempt to spot-weld any bronze or alloy containing a higher percentage of copper than this as the weld will be weak.

Another class of work that can be successfully handled on a spot-welding machine although it is not strictly spot welding, is the construction of wire-goods articles. This consists principally in "mash-welding" crossed wires. It may be done with the same copper die-points as are used for ordinary spot welding, except that the points are usually grooved to hold the wire in the required position. Among the common wire goods put together in this way are lamp-shade frames, oven racks, dish drainers, waste baskets, frames for floral make-ups and so on. Certain classes of butt-welding may also be done on a spot-welding machine by using special attachments.

Spot-welding machines are made in various sizes and designs to meet different requirements, but the general principle of action is the same in all. The illustration,

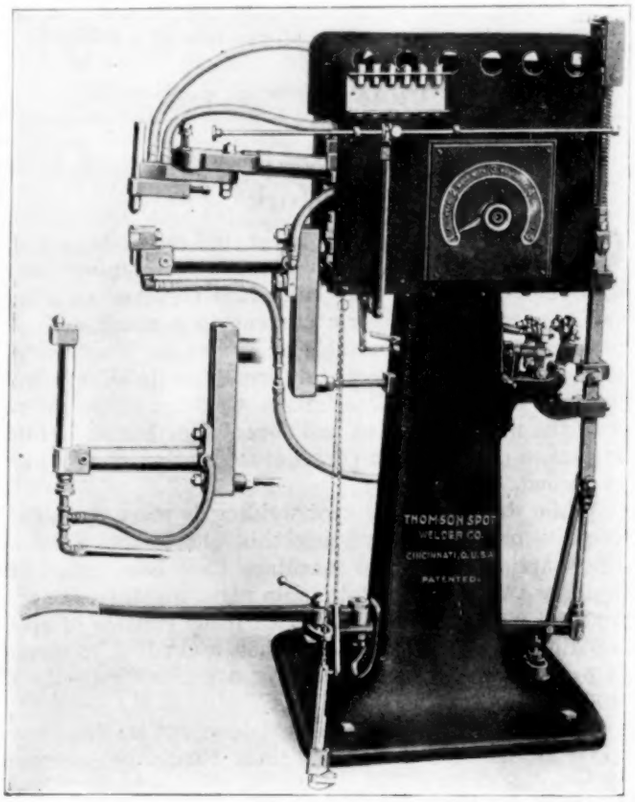


FIG. 393. THE THOMSON LIGHT MANUFACTURING TYPE SPOT-WELDING MACHINE

Fig. 391, shows a Thomson No. 124-A10 machine with the cover removed. This gives an idea of the principal mechanism of all this line of light spot-welding machines. Fig. 392 shows a typical head of one of their line of heavier machines. This type of machine is designed for heavy work on flat sheets or pieces, where considerable pressure is required to bring the parts together to be welded. To withstand heavy pressures, the lower horn is made of T-section cast iron and the current is conducted to the lower copper die-holder by flexible copper laminations, protected on all sizes having over 15-in. throat, by a brass cover, insulated on the inside from the copper by a coating of asbestos sheet.

The sliding head of the machine which carries the upper die-holder is a hollow steel plunger, sliding in a cast-iron head, which bolts to the body of the machine and on which are mounted the control-switches. The pressure is applied by a toggle-motion above the plunger, actuated both by a swiveled hand-lever on top of the head, which may be swung into any position through an arc of 260 deg., and a foot-treadle at the base, which also may be swung in an arc of 30 deg. This enables the operator to control the machine by hand or foot from any position around the front of the machine.

The current-control can be set to work automatically with the downward stroke of the upper die. In this case the pressure at the die-point is through an adjustable spring-cushion in the hollow cylinder-head. The current is automatically turned on after the die-points have come together on the work by further downward pressure of either lever. With the application of final pressure, to squeeze out any burnt metal as the weld is forced together, the current is automatically turned off. When working on pieces where more pressure is required to bring the parts together before welding than can be effected by the spring-cushion without turning on the current, it is possible to set a plug in the head of the machine so that direct connection is obtained from the hand-lever to the upper die-point while the foot-treadle still operates through the spring-cushion and with the automatic current-control. When it is desired to secure maximum pressure, the plug in the head can be set again so that both the hand-lever and the foot-treadle give direct connection to the die-point, the current being controlled by a push-button on the outer end of the hand-lever.

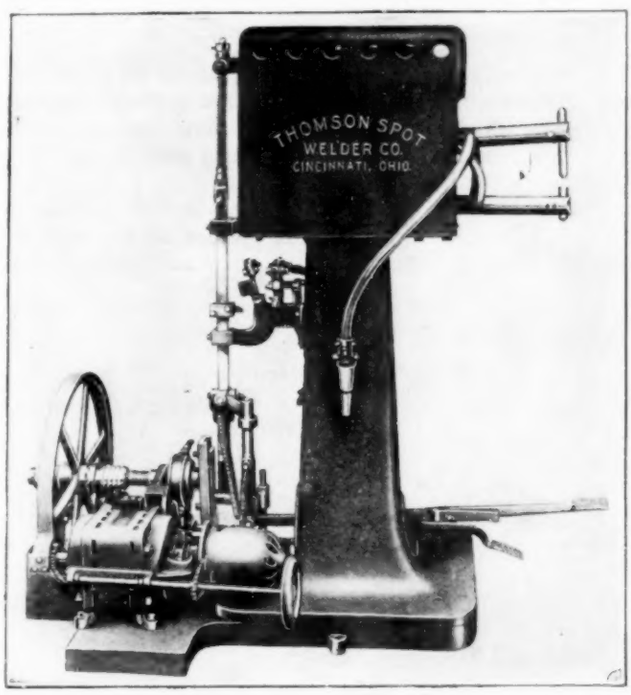


FIG. 394. THE THOMSON SEMI-AUTOMATIC TYPE SPOT-WELDING MACHINE

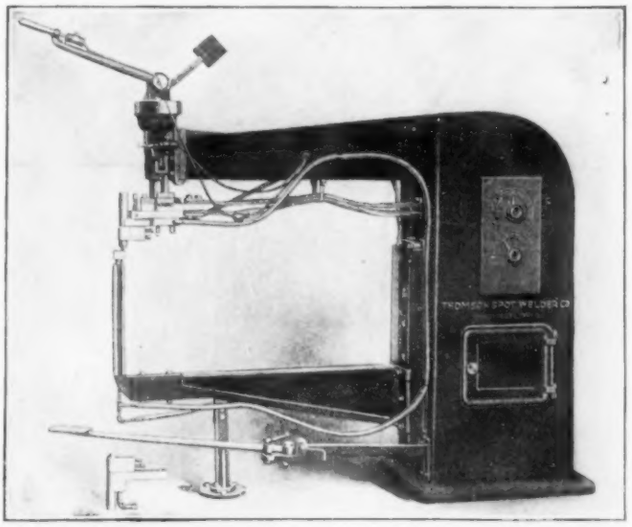


FIG. 393. A THOMSON HEAVY-DUTY SPOT-WELDING MACHINE

The regular line of spot-welding machines of different makes, operate on 110, 220, 440 and 550-volt, alternating current. A welding machine of this kind can only be connected to one phase of an a.c. circuit. The transformer must be made to furnish a large volume of current, at a low voltage, to the electrodes. For further transformer details, the reader is referred to the article on butt-welding.

The Thomson Foot-, Automatic-, and Hand-Operated Machine

The machine shown in Fig. 393 is representative of the Thomson line of small, foot-operated spot-welding machines. These are intended for use on light stock where but little pressure is required. The die-holders are water cooled, and the lower horn bracket allows the horn to be adjusted up or down for the use of various kinds of holders. The automatic switch and adjustable throw-in stop are plainly shown at the back of the machine.

This model is made in several sizes. The first size will weld from 30 to 16 B. & S. gage galvanized iron or soft steel, or to 24 gage brass. It will mash-weld wire from 14 gage to $\frac{1}{4}$ in. in diameter. Its throat depth is 12 in.; the lower horn drop clearance is 9 in.; size is 22 x 45 x 51 in. high; net weight is 825 lb.; full load rating is 5 kw., or 8 kva. The largest machine of this particular series, will weld 26 to 7 gage, B. & S., galvanized iron or soft steel, or 18 gage brass; it will mash-weld 10-gage to $\frac{3}{8}$-in. diameter wire; has an 18-in. depth of throat; is 28 x 60 x 56 in. high; weighs 1,550 lb. and full load rating is 15 kw. or 25 kva.

On repetition work, where the operator has to work the foot-treadle in rapid succession for long periods, it is very tiresome. For such work, power-driven machines similar to the one shown in Fig. 394 are made.

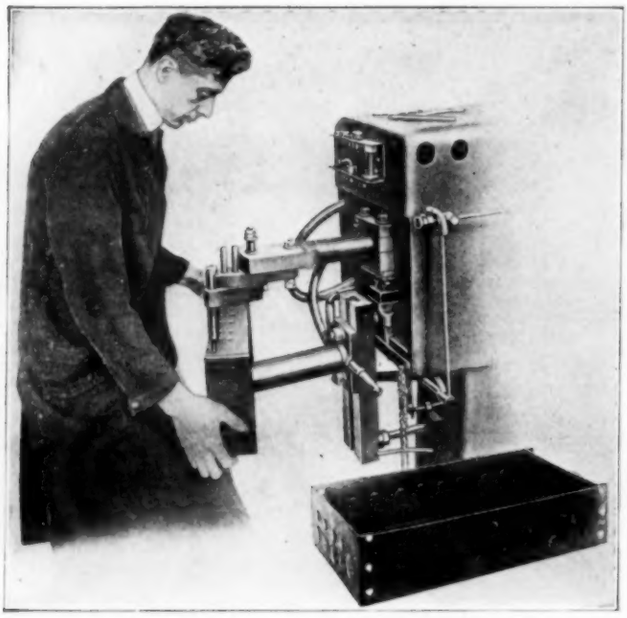


FIG. 396. SPOT-WELDING A SHEET STEEL BOX

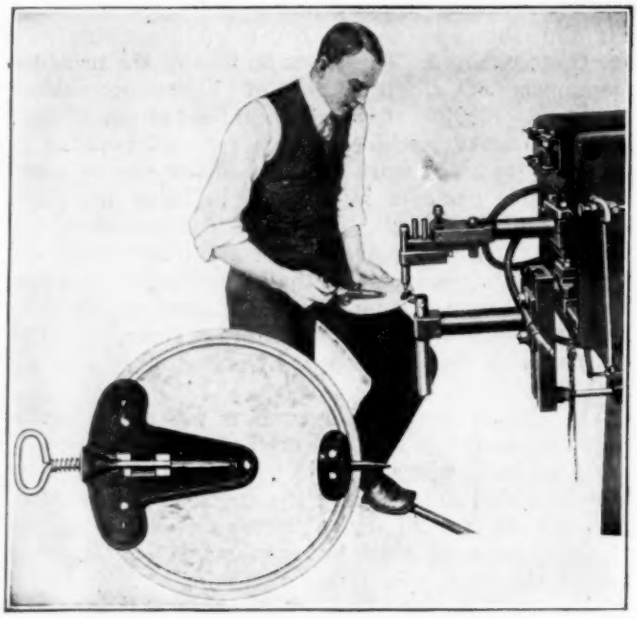


FIG. 399. WELDING STOVE PIPE DAMPERS

These machines are supplied either with individual motor drive or pulley drive, as desired. The control is effected through the small treadle shown. The regular foot-treadle is used while setting up dies, etc. If the operator desires to make but one stroke, he depresses the shorter treadle and immediately releases it, whereupon the machine performs one cycle of operation, automatically turning on the current, applying the pressure, turning off the current, and stopping. A ¼- to ½-hp. operating motor is used according to the size of the machine. Otherwise the capacity of the various sizes is the same as in the regular foot-operated machines. The lower horn and upper arm may be of either style illustrated.

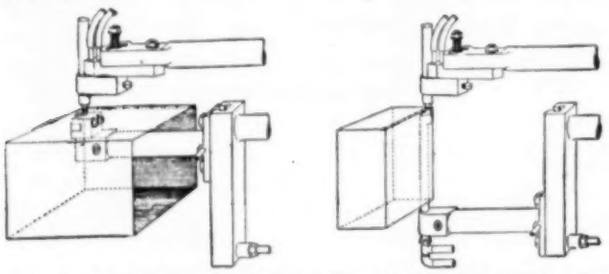


FIG. 397. SHOWING HOW THE HORN AND WELDING POINTS MAY BE SET

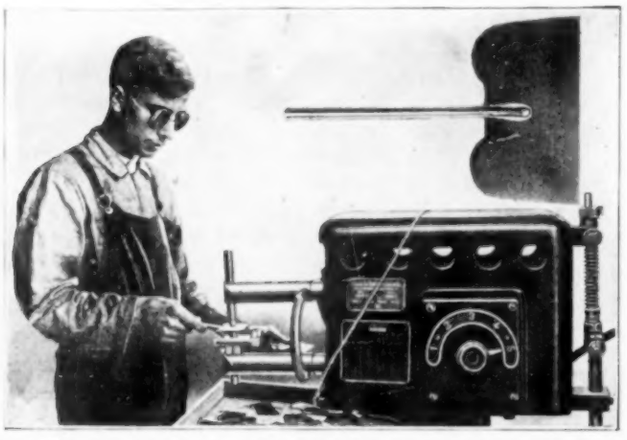


FIG. 398. WELDING SMALL HOE BLADES TO THE SHANKS

The machine shown in Fig. 395 is a hand-lever operated machine, although supplied with a foot-treadle which can be swung back out of the way when not needed. This machine is typical of the Thomson designs used for the heavier run of commercial work. On the various sizes, the capacity for spot-welding is from 22 B. & S. gage galvanized iron or steel up to No. 0 gage, or to 14 gage brass. Mash-welds may be made on from ⅛- to ⅝-in. diameter wire. The throat capacities run from 15 to 51 in. and the lower horn adjustment is from 12 to 24 in. The smallest size is 28 x 62 x 75 in. high and the largest size 28 x 98 x 75 in. high. The weights run from 2,335 to 3,225 and the full load ratings from 20 to 40 kw. or 35 to 67 kva. Various shaped horns, dies and other equipment is furnished to meet special demands.

Examples of Spot-Welding Work

In connection with the Thomson machines, the welding of the corners of a sheet-steel box is shown in Fig. 396. The illustrations in Fig. 397 show how the lower horn is raised for welding side seams and dropped for welding on the bottom of a box.

The welding of small hoe blades to the shanks, is shown in Fig. 398. These are welded at the rate of 840 per hour, the shanks being bent afterward. Stove-

FIG. 400. MASH-WELDING LAMP SHADE FRAMES

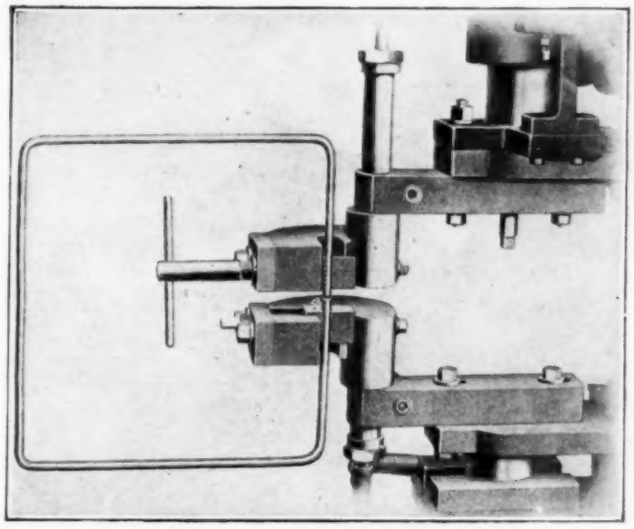


FIG. 401. BUTT-WELDING ATTACHMENT FOR A SPOT-WELDING MACHINE

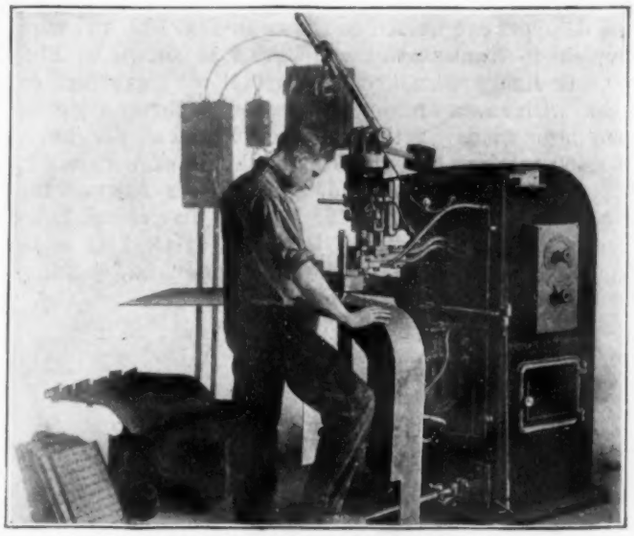


FIG. 403. WELDING 12-GAGE IRON FOR GUARDS

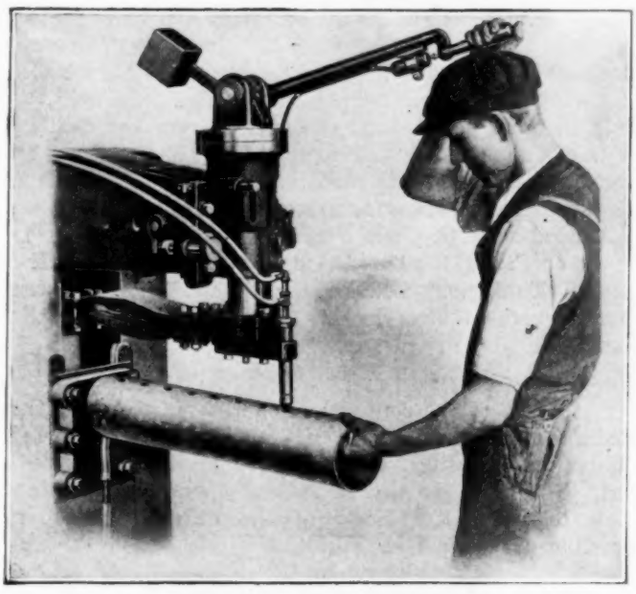


FIG. 402. WELDING GALVANIZED IRON PIPE

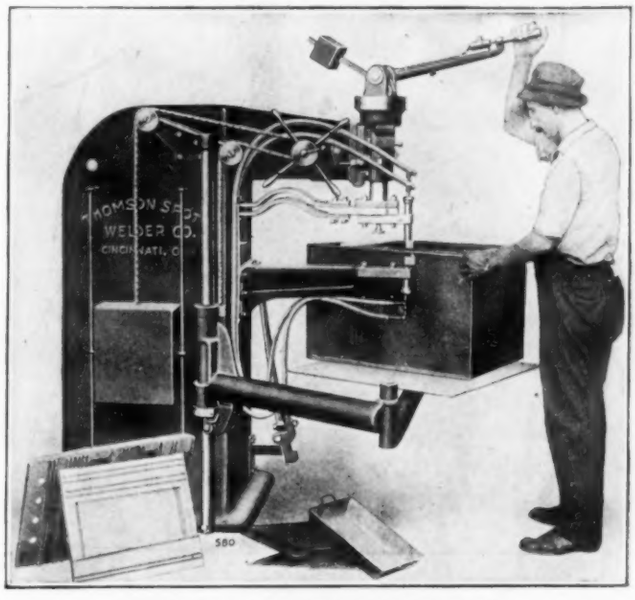


FIG. 404. WELDING STOVE PARTS

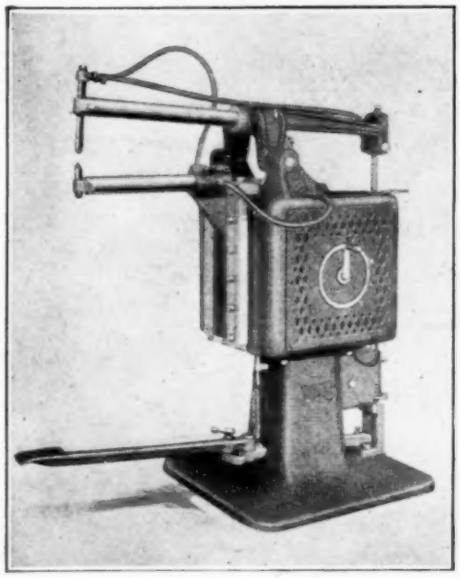


FIG. 405. WINFIELD SLIDING HORN SPOT-WELDING MACHINE

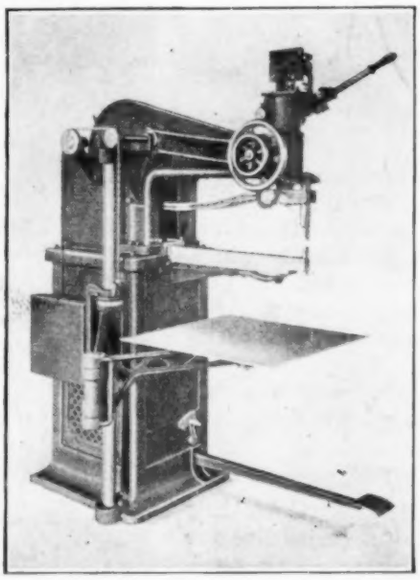


FIG. 406. WINFIELD HEAVY-DUTY MACHINE WITH ADJUSTABLE TABLE

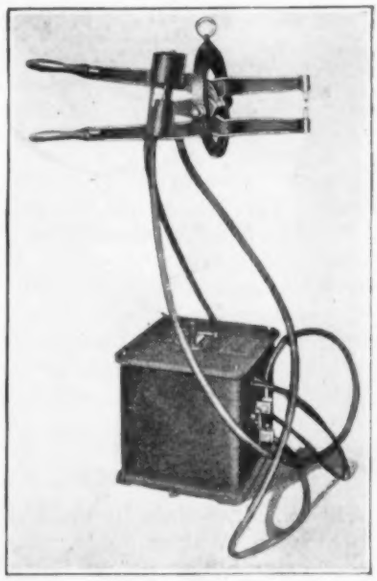


FIG. 407. WINFIELD PORTABLE SPOT-WELDING MACHINE

pipe dampers are welded as shown in Fig. 399, and wire lamp-shade frames are mash-welded as shown in Fig. 400. Ordinary wire and sheet-metal oven gratings or racks, with seven cross-wires welded to the end pieces, have been made at the rate of 100 racks per hour, or 1,400 mash-welds. On certain kinds of wire work, it is desirable to butt-weld, and for this purpose the attachment shown in Fig. 401 is used. In general, however, where any amount of this kind of work is to be done, it is better to employ a regular butt-welding machine of the small pedestal or bench type.

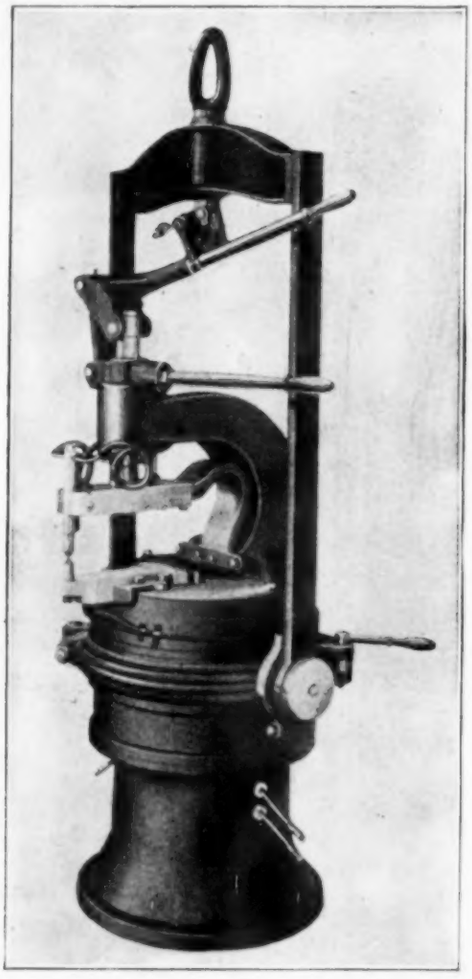


FIG. 408. WINFIELD PORTABLE MACHINE WITH SWIVEL HEAD

The spot-welding of galvanized ventilating pipe is shown in Fig. 402, and in Fig. 403 is shown the welding of 12 gage sheet steel machine guards. In this illustration the operator is using the foot-treadle which leaves his hands free to manipulate the work. In Fig. 404 the operator is welding gas-stove parts and the foot-treadle is thrown back out of the way. A special bracket is employed to hold the work. The joints of this bracket are ball-bearing, making it very easy to swing the work exactly where it is wanted to obtain the spot-welds.

The Winfield Machines

The machines made by the Winfield Electric Welding Machine Co., Warren, Ohio, comprise a varied line for every conceivable spot-welding purpose. In general, Figs. 405 and 406 may be taken as typical of their light and heavy spot-welding machines. Fig. 407 shows a

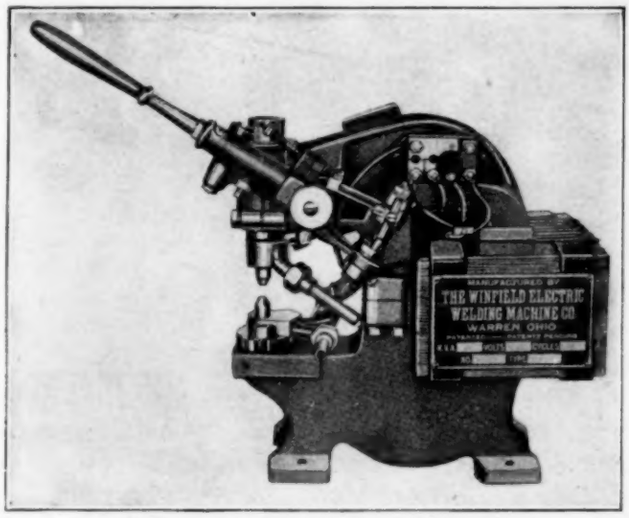


FIG. 409. SMALL WINFIELD BENCH MACHINE

very convenient form of portable machine. In Fig. 408 is shown a much heavier portable machine with swiveling head, and in Fig. 409 is a small bench machine that is exceedingly useful for light work.

A very interesting machine is shown in Fig. 410. This has the entire head suspended from the ceiling, so that work, like the automobile body shown, may be worked under it. This machine is in use in the plant of the Herbert Manufacturing Co., Detroit.

A good way to place a machine for some work is shown in Fig. 411. This is employed in the shop of the Terrell Equipment Co., Grand Rapids, Mich., in the manufacture of steel lockers, steel furniture and the like.

Federal Welding Machines

A feature of the spot-welding machines made by the Federal Machine and Welder Co., Warren, Ohio, are the "universal" welding points used on most of their output. The principle will be instantly grasped by referring to Fig. 412. Some of the different positions possible are shown in Fig. 413.

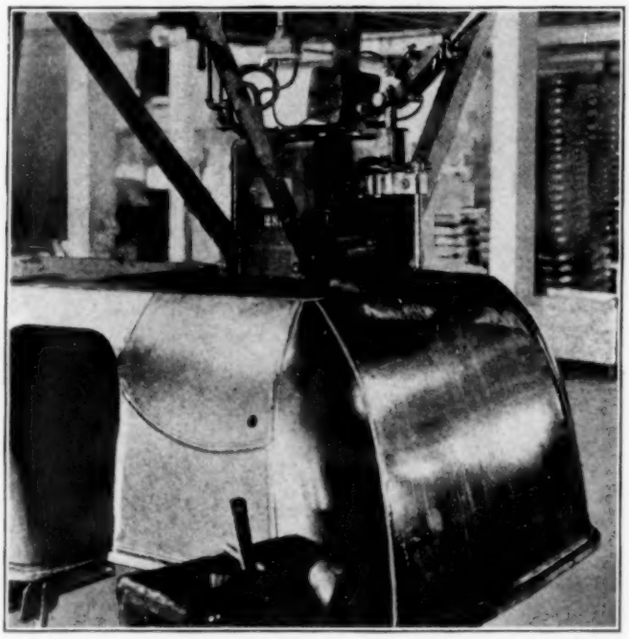


FIG. 410. WINFIELD MACHINE WITH SUSPENDED HEAD FOR WELDING AUTOMOBILE BODIES

FIG. 411. CONVENIENT SETTING OF MACHINE FOR SHEET METAL WORK

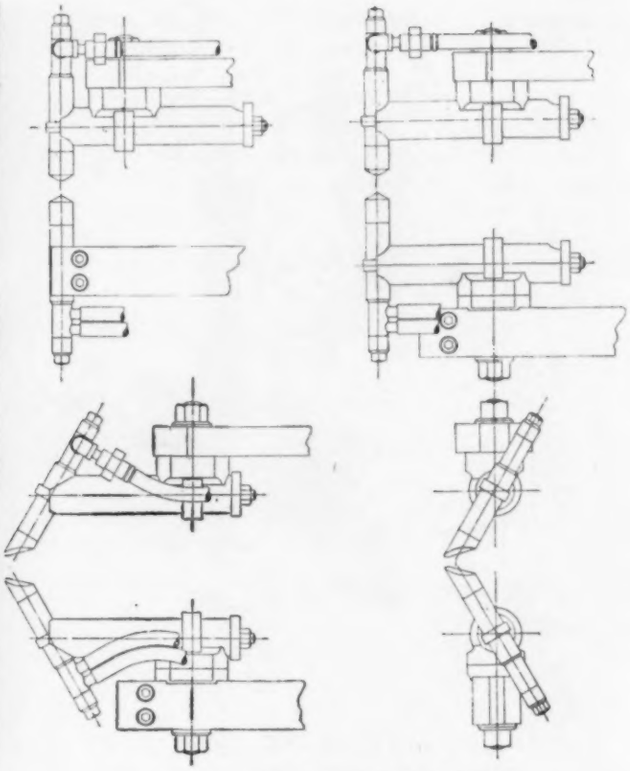


FIG. 413. A FEW POSITIONS OF THE UNIVERSAL POINTS

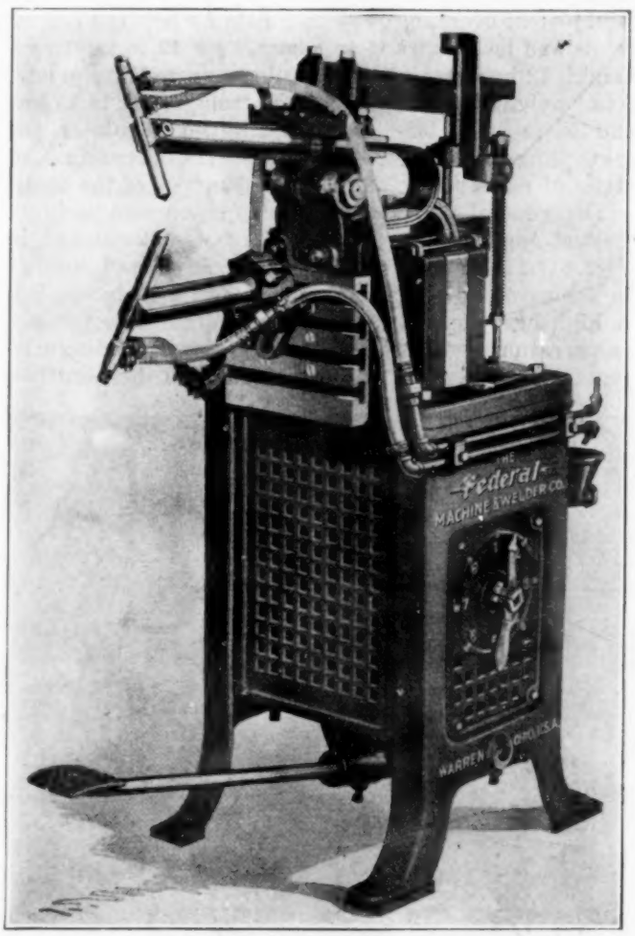


FIG. 412. FEDERAL WELDING MACHINE WITH UNIVERSAL POINTS

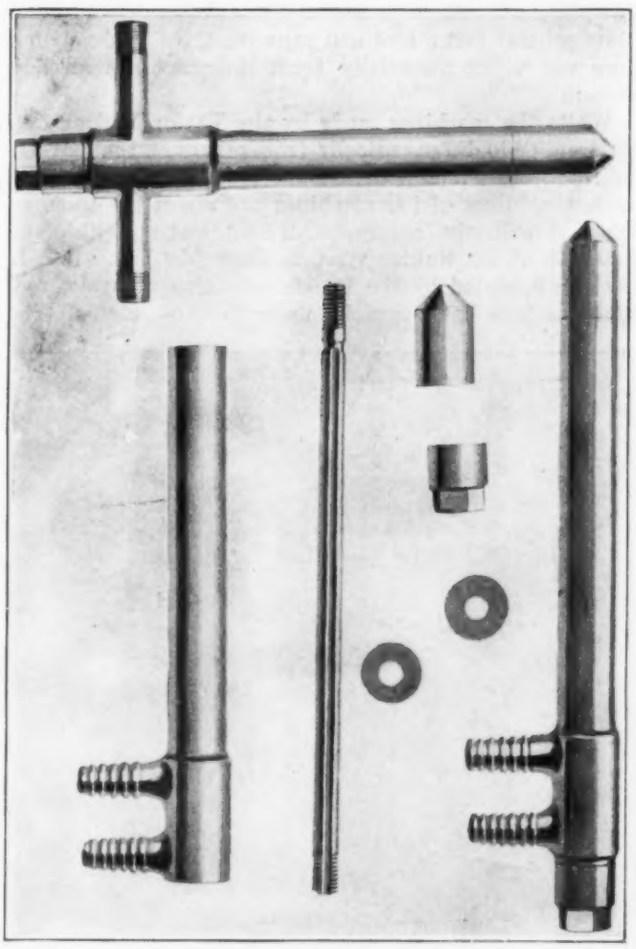


FIG. 414. FEDERAL WATER-COOLED POINTS

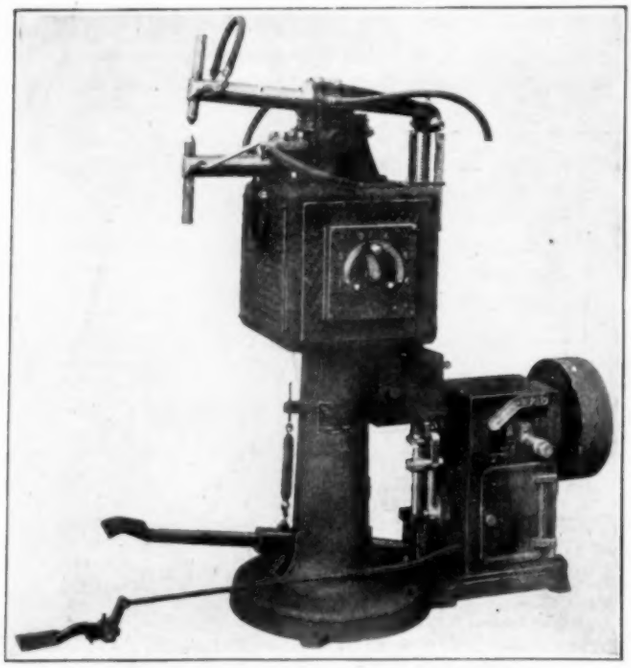


FIG. 415 TAYLOR CROSS-CURRENT SPOT-WELDING MACHINE

Another feature of these machines, is the use of the type of water-cooled points shown in Fig. 414. The welding point is copper and it is attached to the holder in such a way that the water flows within half an inch of the actual welding contact.

In general form, size and capacities, the Federal line does not differ materially from the machines already shown.

While the machines made by the Taylor Welder Co., Warren, Ohio differ radically from others on the market, in that they employ double electrodes and cross current, the forms of the machines are about the same as those previously shown. An automatic belt-driven machine of the lighter type, is shown in Fig. 415. It may be operated by the foot-treadle also when desired. This machine has a capacity up to two ½-in. plates. The

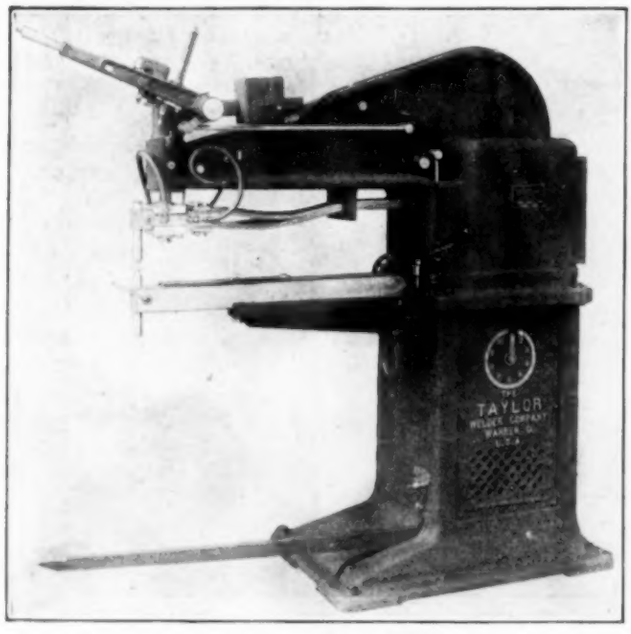


FIG. 416. TAYLOR HEAVY-DUTY MACHINE

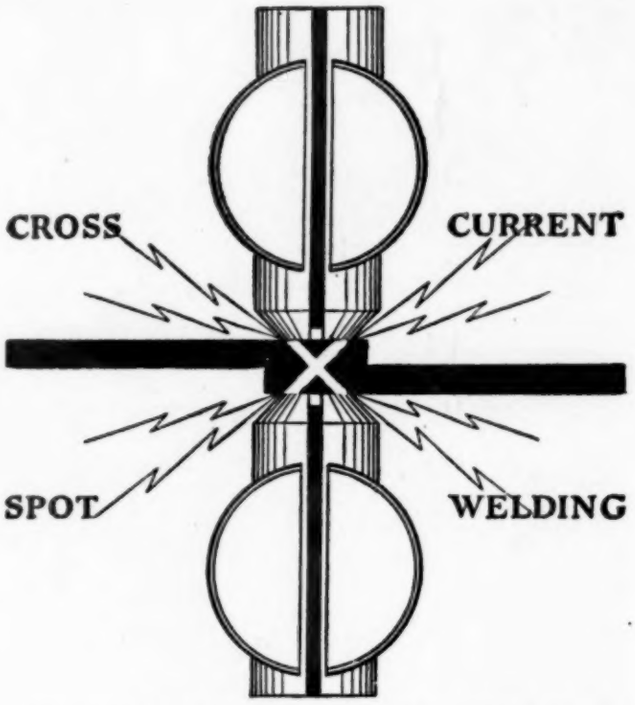


FIG. 417. DIAGRAM OF THE CURRENT ACTION IN A TAYLOR MACHINE

horns are water-cooled and the adjustable points are locked in with a wrench as shown. Fig. 416 shows a heavier type of machine. This has a capacity of two ½-in. plates; overhang is 36 in.; distance between copper bands and lower horn, 6 in.; base, 26 x 42 in.; extreme height, 72 in.; greatest opening between welding points, 3 in.; weight about 2,400 lb. The transformer is 35 kw. and there is a ten-step self-contained regulator for controlling the current. This firm makes other sizes and styles of machines, to meet all the demands of the trade.

The general principle of the cross-current welding method employed in these machines, is illustrated in Fig. 417. Two separate currents are caused to flow in a bias direction through the material to be welded. A high heat concentration is claimed for this method. In operation, the positives of two separate welding currents are on one side of the material and the negatives

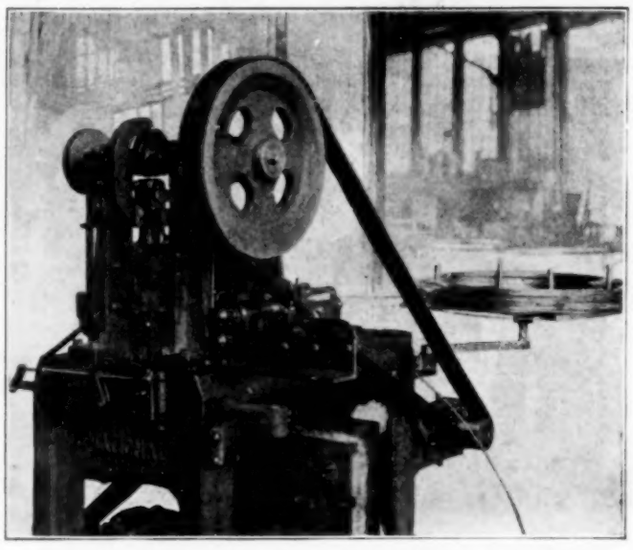


FIG. 418. AUTOMATIC HOG-RING MACHINE

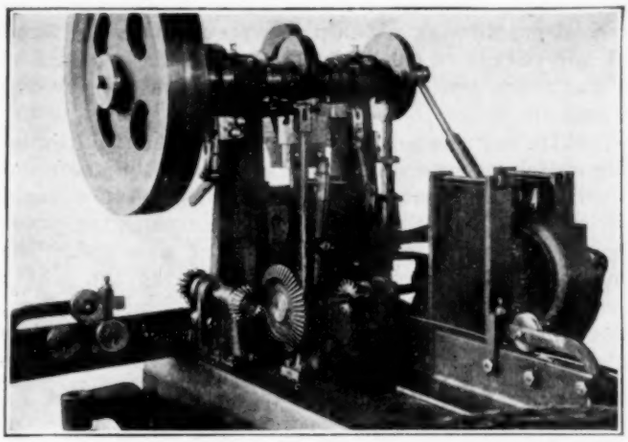


FIG. 419. PARTIAL REAR VIEW OF HOG-RING MACHINE

on the other, with the co-working electrodes of each set so that the current travels diagonally across. An advantage claimed is that the electrodes on each side of the material may be set far enough apart to allow of the insertion of some hard material which will take the pressure instead of the softer copper welding points. These hard dies may be operated independently of the copper ones and make it possible to weld heavier material without crushing the copper die points, as these need to be pressed together only enough to give good electrical contact with the work. The process is also unique in that it can be operated with a multiphase circuit without unbalancing the lines, which is not the case with any spot-welding machine employing a single current.

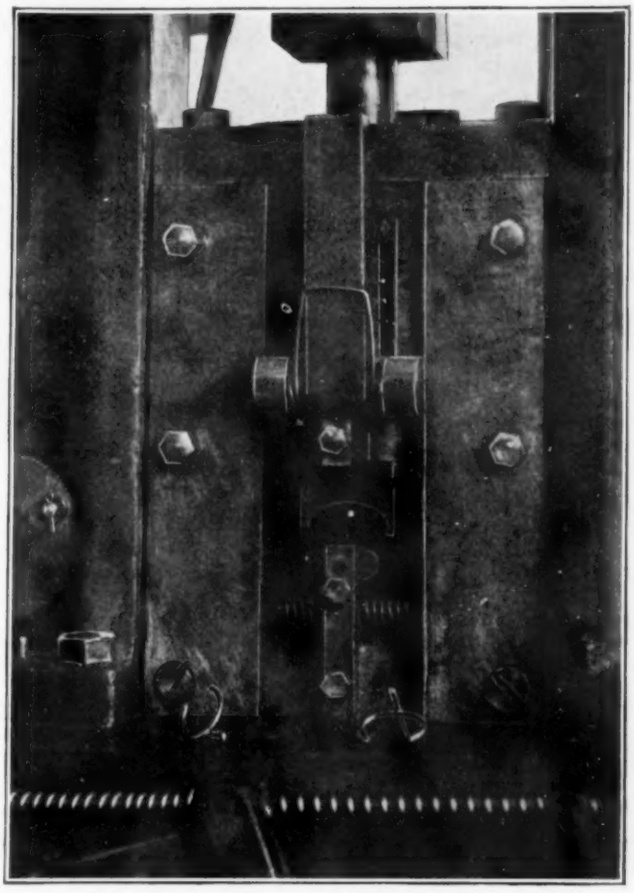


FIG. 420. CLOSE-UP OF FRONT OF HOG-RING MACHINE

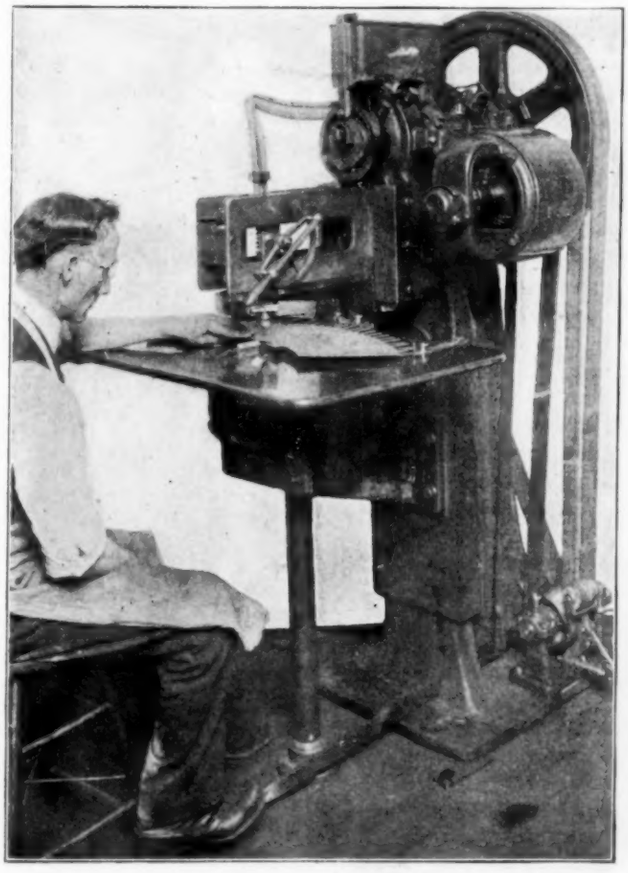


FIG. 421. GENERAL ELECTRIC SPACE-BLOCK WELDING MACHINE

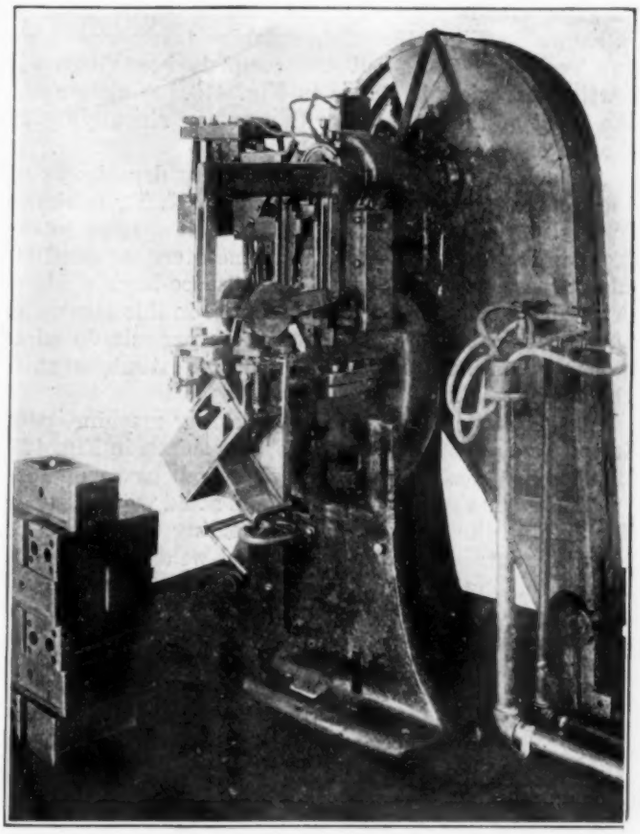


FIG. 422. COMBINATION SPOT- AND LINE-WELDING MACHINE, SET UP FOR LINE-WELDING CAN SEAMS

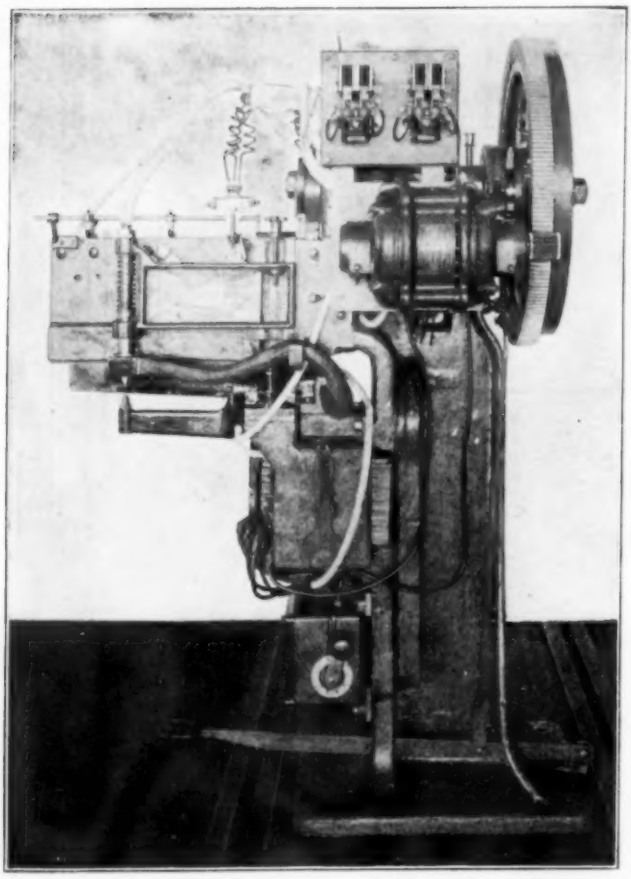


FIG. 423. A COMBINATION MACHINE FROM THE SPOT-WELDING SIDE

An automatic machine for forming and mash-welding 11 gage wire hog rings, at the rate of 60,000 per day, is shown in Fig. 418. This machine takes wire from two reels and turns out the complete hog rings. A partial rear view is shown in Fig. 419. A close-up of the front of the machine, with two hog rings lying on the platen, is given in Fig. 420.

A machine in use in the punch press department of the General Electric Co., Schenectady, N. Y., is shown in Fig. 421. This machine welds small spacers to the iron laminations for motors and generators for ventilating purposes, and hence is called a "space-block welder." A number of these machines are in use in this plant, and they are capable of welding 60 spots per minute when working continuously, not allowing for time to shift the stock.

A combination spot- and line-welding machine, used in the General Electric Co.'s shops, is shown in Fig. 422. This is employed for welding oil switch boxes up to $\frac{1}{4}$ in. thick. As shown, the machine is fitted with a fixture for holding the boxes while line-welding the seams. A separate fixture is put on for spot-welding work. A seam 6 in. long can be line-welded on this machine.

Another combination machine, used in the same shops, is shown in Fig. 423. This machine carries both the spot- and the line-welding fixtures at the same time. Fig. 424 shows the machine from the line-welding side. As shown, the machines are ready for welding straight plates. Machines of this kind should find a considerable field where it is desired to tack seams before line welding them. These machines have a capacity of 20 kva., and will weld up to $\frac{3}{8}$ in. thick, and seams 18 in. long.

Line welding machines, as developed in the Schenectady plant, comprise a transformer with a one turn secondary, through which a heavy current is delivered at low voltage to the material through the medium of a stationary jaw and rolling wheel. Both the jaw and wheel are water cooled and pressure is applied to the wheel the same as to a spot-welding tip. A small revolving switch mechanically geared to the driving motor and welding wheel operates a set of contactors or solenoid switches to throw the power on once a second, the power being on $\frac{3}{4}$ of a second, and off $\frac{1}{4}$ of a second. The mechanism is synchronized so that during the $\frac{3}{4}$ of a second the power is on, the welding wheel is rolling, and during the remaining $\frac{1}{4}$ of a second the wheel is stationary under pressure while the soft metal is solidifying, thus completing the weld.

Spot-Welding Machines for Ship Work

During the World War, welding of all kinds took huge steps forward. Spot-welding developed at least as much as any other kind. Writing in the *General Electric Review*, J. M. Weed says:

> The machines to be described are two portable welders, one with 12-in. reach and the other with 27-in. reach, for use in the fabrication of structural ship parts, and one stationary machine with 6-ft. reach designed for welding two spots at the same time on large ship plates.
>
> A preliminary survey of the structural work in shipbuilding indicated that about 80 per cent of this work could be done by a machine of 12-in. reach, and that a 27-in. reach would include the other 20 per cent. Since both the weight of the machine and the kva. required for its operation are about 33 per cent greater for the 27-in. reach than for the 12-in., it seemed advisable to develop two machines rather than one with the longer reach.
>
> These machines were to a certain obvious extent pat-

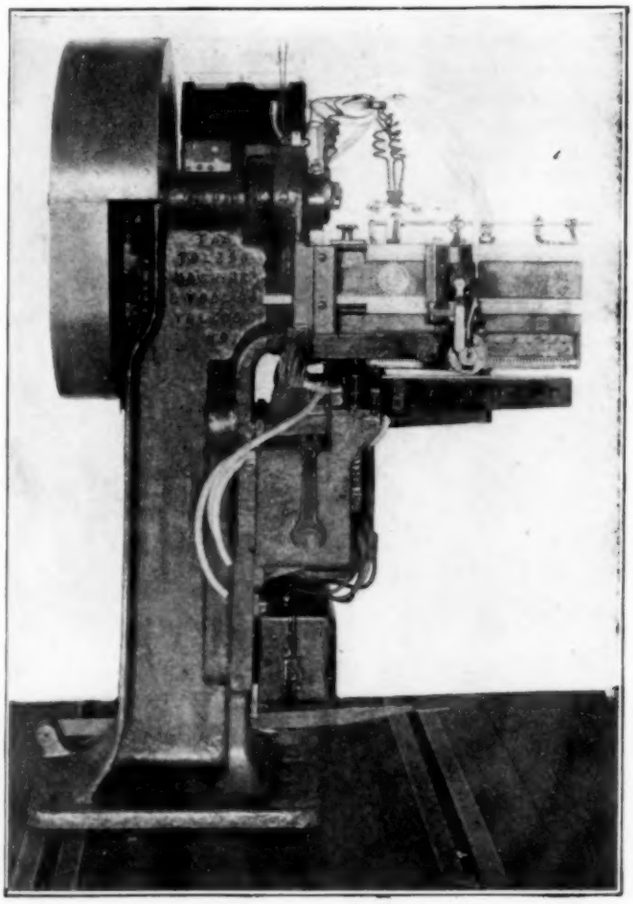


FIG. 424. MACHINE FROM THE LINE-WELDING SIDE

terned after the riveting machines, which they were intended to replace as will be seen from Fig. 425. They are necessarily considerably heavier than the riveting machines, but like these they are provided with bales for crane suspension, for the purpose of carrying the machines around the assembled work or parts to be welded.

The maximum welding current available in these machines, with a steel plate enclosed to the full depth of the gap, is about 37,500 amperes, with the maximum applied voltage of 534 volts at 60 cycles. Reduced voltages, giving smaller currents, are obtained in six equal steps, ranging from 534 down to 267 volts, from the taps of the regulating transformers furnished with the machines.

This wide range of voltage and current was provided in order to meet the possible requirements for a considerable range in thickness of work, and for experimental purposes. Tests have shown, however, that the machines will operate satisfactorily on work of thicknesses over the range on which they are likely to be used when connected directly on a 440-volt, 60-cycle circuit, with no regulating transformers. Two plates ½-in. thick are welded together in spots from 1 in. to 1¼ in. in diameter, in from 12 to 15 seconds. Thicker plates require more time and thinner plates less time.

The welding current under these conditions is about 31,000 amp.; the primary current is about 600 amp. for the 12-in. machine and about 800 amp. for the 27-in. machine, the corresponding kva. at 440 volts, being 265 and 350 respectively.

Since the reactance of the welding circuit is large as compared with the resistance, the voltage necessary for a given current, and consequently the kva. necessary for the operation of the machine, is almost proportional to the frequency. Thus, these machines operate satisfactorily from a 25-cycle circuit at 220 volts, with the advantage that where the power-factor is from 30 to 40 per cent at 60 cycles, it is from 60 to 75 per cent at 25 cycles, and the kva. required at 25 cycles is about one-half that required at 60 cycles.

The maximum mechanical pressure on the work for which those machines are designed is 25,000 lb. This is obtained from an 8-in. air cylinder, with an air pressure of 100 lb. per square inch, acting through a lever arm of 5 to 1 ratio. Lower pressures on the work are obtained with correspondingly reduced air pressures. A pressure-reducing valve is provided for this purpose, and also a pressure gage for indicating the pressure on the machine side of the valve.

FIG. 425. PORTABLE SPOT-WELDING MACHINE, WITH 27-IN. THROAT DEPTH, CAPABLE OF WELDING TWO PLATES ⅜ IN. THICK IN SPOTS 1 IN. IN DIAMETER. MADE BY THE GENERAL ELECTRIC CO.

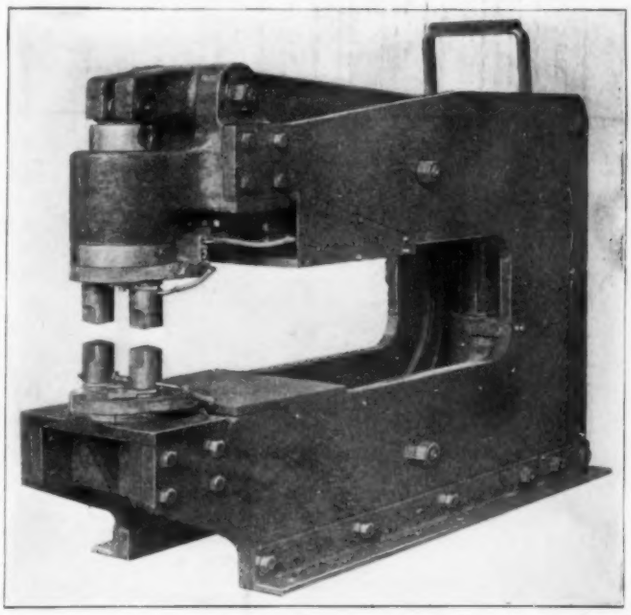


FIG. 426. DUPLEX SPOT-WELDING MACHINE, MADE BY THE GENERAL ELECTRIC CO. 6-FT. THROAT DEPTH, AND CAPABLE OF WELDING TOGETHER TWO STEEL PLATES ¾ IN. THICK, IN TWO SPOTS 1¼ IN. IN DIAMETER

The pressure required to do satisfactory welding depends upon the thickness of the plates. It is necessary that the areas to be welded should at the start be brought into more intimate contact than the surrounding areas, in order that the current may be properly localized, and the heat generated in the region where it is needed. It is therefore necessary, on account of irregularities in the plate surface, that the pressure should be great enough to spring the cold plate sufficiently to overcome the irregularities. The pressure which will do this with heavy plates is ample for effecting the weld after the welding temperature is reached.

It should be explained in this connection that the rate of heating at the surfaces to be welded depends largely upon the contact resistance, and consequently upon the condition of the plates and the pressure used. If the plates are clean and bright, and the pressure high, the rate of heating with a given amount of current is slow and the welding efficiency is poor. This makes it difficult to weld heavy plates if they are clean, since, as stated above, it is necessary to use large pressure with heavy plates to insure a better contact of the areas to be welded than that of surrounding areas. It is much easier to weld plates which carry the original coat of mill scale, or a fairly heavy coating of rust or dirt, affording a considerable resistance which is not sensitive to pressure. If this resistance is too great, the necessary current will not flow, of course, but if the scale is not too heavy it has little effect upon the current, the high reactance of the welding circuit giving it practically a constant current characteristic and making the rate of heating proportional to the resistance within certain limits. The scale melts at about the welding temperature of the steel, and is squeezed out by the high pressures used, permitting the clean surfaces of the steel to come together and effect a good weld.

A gage pressure of about 70 lb., giving 17,500 lb, pressure upon the work, has been found to give good results under these conditions in ½-in. plates.

Both the mechanical pressure and the current are transmitted to the work in these machines through heavy copper blocks or welding electrodes. The shape of the tips of these electrodes is that of a very flat truncated cone.

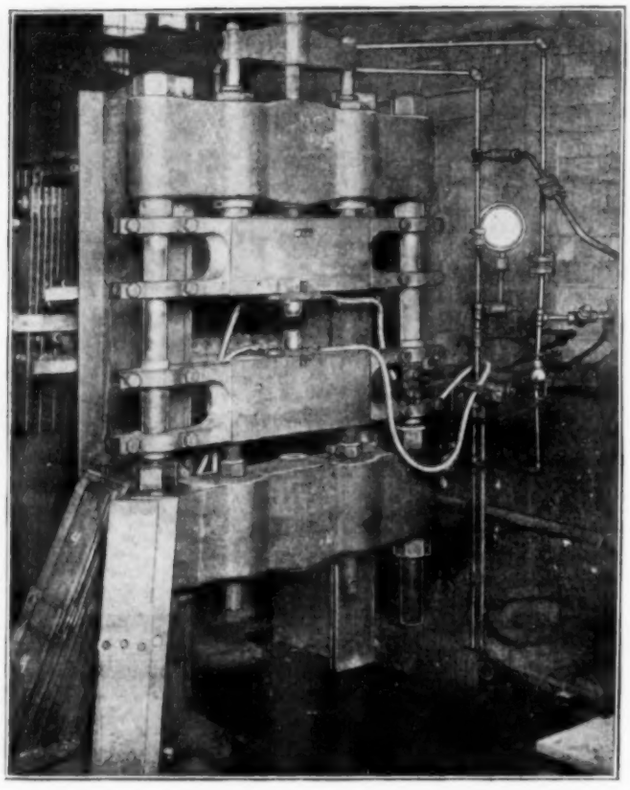


FIG. 427. GENERAL ELECTRIC CO.'S EXPERIMENTAL SPOT-WELDING MACHINE. CURRENT CAPACITY 100,000 AMP. PRESSURE CAPACITY 36 TONS. HAS WELDED THREE PLATES, EACH 1 IN. THICK

The severity of the conditions to which the tips of the electrodes are subjected will be understood when it is considered that the current density in the electrode material at this point is approximately 60,000 amp. per square inch, and that this material is in contact with the steel plates which are brought to the welding temperature, under pressures of 15,000 to 20,000 lb. per square inch. It must be remembered, also, that copper, which is the best material available for this purpose, softens at a temperature considerably lower than the welding temperature of steel. The difficulty of making the electrode tips stand up under the conditions to which they are subjected has, in fact, constituted the most serious problem which has been met in the development of these machines.

The shape of these electrodes gives them every possible advantage in freely conducting the current to and the heat away from the electrode tips, and in giving them the mechanical reinforcement of the cooler surrounding material. However, it has been found necessary to reduce, as far as possible, the heat generated at the tips of the electrodes by cleaning the rust and mill scale from the surfaces of the plates beneath the electrodes. The most convenient way which has been found for doing this is by means of a sand blast. The bodies of the electrodes are also internally water-cooled by a stream of water flowing continually through them. Still, after all of these things have been done, a gradual deformation of the tip of the electrode will occur, increasing its area of contact with the work, and thus reducing the current density in the work and the pressure density below the values needed for welding. This would make it necessary to change electrodes and to reshape the tips very frequently, and the total life of the electrodes would be short on account of the frequent dressings.

An effort has been made to overcome this difficulty by protecting the tip of the electrode by a thin copper cap, which may be quickly and cheaply replaced. As many as 160 welds have been made with a single copper cap, $\frac{1}{16}$ in. thick, before it became necessary to replace it. Unfortunately this does not entirely prevent the deformation of the electrode tip, but it stands up much better than it does without the cap.

Another method which has been tried for overcoming this trouble is by making the tip portion of the electrode removable, in the form of a disk or button, held in place by a clamp engaging in a neck or groove on the electrode body. While this protects the electrode body from deformation and wear, the tip itself does not stand up so well as does the combination of electrode and cap, where the tip of the electrode is not separated from the body.

Some electrodes have been prepared which combine the features of the removable tip and the cap. These give the advantage of a permanent electrode body, and the removable tip with the protecting cap stand up better than the unprotected tip.

Some interesting features were introduced in the design of the transformers which are integral parts of these machines, owing to the necessity for small size and weight. Internal water cooling was adopted for the windings, which makes it possible to use current densities very much higher than those found in ordinary power transformers. The conductor for the primary windings is $\frac{3}{8}$ x $\frac{1}{4}$-in. copper tubing, which was obtained in standard lengths and annealed before winding by passing it through an oven which is used for annealing sheathed wire during the process of drawing. No difficulty was found in winding this tubing directly on the insulated core, the joints between lengths being made by brazing with silver solder. The entire winding consists of four layers of thirteen turns each in the 12-in. machine and three layers of thirteen turns each in the 27-in. machine.

The U-shaped single-turn secondaries were slipped over the outside of the primary windings in the assembly of the transformers. These were constructed of two copper plates each $\frac{3}{8}$ in. thick and $6\frac{3}{4}$ in. wide, which were bent to the proper shape in the blacksmith shop, and assembled one inside the other with a $\frac{1}{4}$-in. space between them. Narrow strips of copper were inserted between the plates along the edges, and the plates were brazed to these strips, thus making a water-tight chamber or passage for the circulation of the cooling water.

At 31,000 amp. the current density in these secondaries is about 6,200 amp. per square inch, the corresponding densities in the primary windings being about 7,000 for the 12-in. and 9,000 for the 27-in. machine.

In case these machines are started up without the cooling water having been turned on, the temperature rise in these

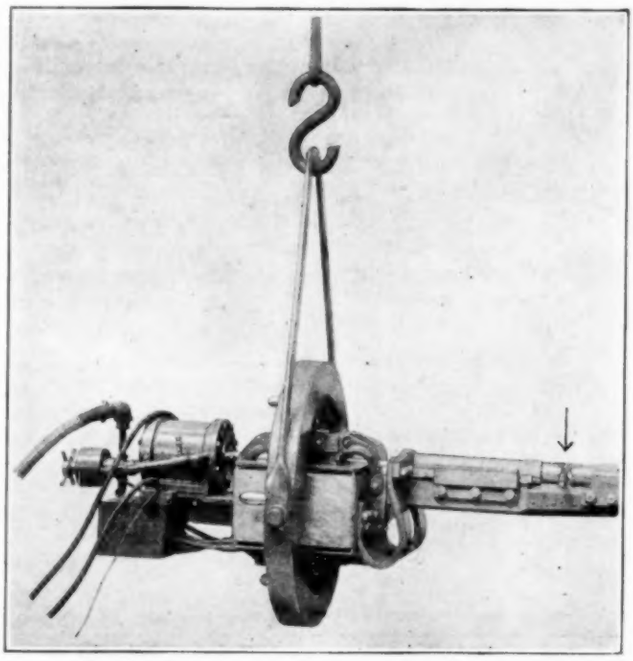


FIG. 428. PORTABLE MACHINE FOR MASH-WELDING SQUARE OR ROUND RODS

windings will be rapid, and in order to avoid the danger of burning the insulation, asbestos and mica have been used. The copper tubing was taped with asbestos tape, and alternate layers of sheet asbestos and mica pads were used between layers of the primary winding, and between primary and secondary and between primary and core. Space blocks of asbestos lumber, which is a compound of asbestos and Portland cement, were used at the ends of the core and at the ends of the winding layers. The complete transformer, after assembly, was impregnated with bakelite. The result is a solid mechanical unit which will not be injured by temperatures not exceeding 150 deg C. Several welds could be made without turning on the cooling water before this temperature would be reached.

The transformers are mounted in a chamber in the body of the frame. The long end of the U-shaped secondary runs out along the arm of the frame and bolts directly to the copper base upon which the bottom electrode is mounted. The short end connects to the base of the top electrode through flexible leads of laminated copper, to permit of the necessary motion for engaging the work.

The copper bases upon which the electrodes are mounted are insulated from the frame by a layer of mica, the bolts which hold them in place being also insulated by mica.

The cooling water for these machines is divided into two parallel paths, one being through the primary winding, and the other through the secondary and the electrodes in series. Separate valves are supplied for independent adjustment of the flow in the two paths. The resistance of ordinary hydrant water is sufficiently great as to cause no concern regarding the grounding or short-circuiting of the windings through the cooling water, although it is necessary to use rubber tubing or hose for leading it in and out.

Some pieces of ½ x 2-in. machine steel were welded in seven seconds with a current of 33,000 amp. They were afterward clamped in a vise and hammered into U-shapes. Small pieces were sheared from the seam where two ½-in. plates had been welded together in a row of spots. The pieces of the plates were then split apart with a cold chisel in one case, and an effort was made to do so in the other, with the result that one piece of plate broke at the welds before the welds would themselves break. Such tests as these show that the welds are at least as strong as the material on which the welds were made. Some samples of the ½ x 2-in. stock welded together in the same manner were tested by bending in an edgewise direction, thus subjecting the welds to a shearing torque. The ultimate strength calculated from these tests was in the neighborhood of 65,000 lb. per square inch. These tests showed also a very tough weld, the deflection being almost 45 deg. in some cases before the final rupture occurred. The maximum load occurred with a deflection of from 3 to 5 deg. with a very gradual reduction in the load from this time till the final rupture.

The Duplex Welding Machine

The machine shown in Fig. 426 was developed for the application of electric welding as a substitute for riveting on parts of the ship composed of large-sized plates, which may be fabricated before they are assembled in the ship. The specification to which it was built stated that it should have a 6-ft. reach and should be capable of welding together two plates ¾ in. thick in two spots at the same time. A machine capable of doing this work, with a 6-ft. gap, is necessarily so heavy as to preclude even semi-portability, and no effort was made in this direction.

With the welding circuit enclosing a 6-ft. gap, and carrying the very heavy current necessary to weld ¾-in. plates, the kva. required would be very large. A great reduction in the kva. and at the same time a doubling of the work done, is obtained in this machine by the use of two transformers as integral parts of the machine, and two pairs of electrodes, thus providing for the welding of two spots at the same time. The transformers are mounted in the frame of the machine, on opposite sides of the work, and as near to the welding electrodes as possible, so as to obtain the minimum reactance in the welding circuit. The polarity of the electrodes on one side of the work is the reverse of that of the opposed electrodes, thus giving a

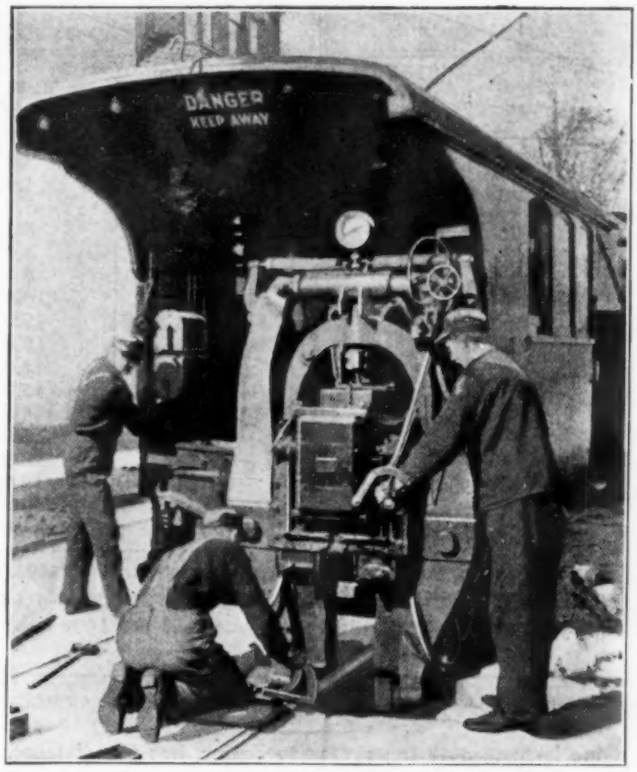


FIG. 429. LORAIN MACHINE FOR SPOT-WELDING ELECTRIC RAIL BONDS

series arrangement of the transformer secondaries, the current from each transformer flowing through both of the spots to be welded.

The bottom electrodes are stationary, and the copper bases which bear them are connected rigidly to the terminals of their transformer, while the bases which carry the top electrodes are connected through flexible leads of laminated copper, to permit of the motion necessary for engaging the work.

Previous tests with an experimental machine had shown that, to successfully weld two spots at the same time in the manner adopted here, it is necessary that the pressures shall be independently applied. Otherwise, due to inequalities in the thickness of the work, or in the wear and tear of the electrodes, the pressure may be much greater on one of the spots than on the other. This results in unequal heating in the two spots. The resistance and its heating effect are less in the spot with the greater pressure. The two top electrodes in this machine were therefore mounted on separate plungers, operated by separate pistons through independent levers.

The pressures obtained in this machine with an air pressure of 100 lb. per square inch, are 30,000 lb. on each spot, giving a total pressure of 60,000 lb. which must be exerted by the frame around the 6-ft. gap. The necessary strength is obtained by constructing the frame of two steel plates, each 2 in. thick, properly spaced and rigidly bolted together.

The use of steel in this case is easily permissible on account of the restricted area of the welding circuit and its relative position, resulting in small tendency for magnetic flux to enter the frame. However, the heads carrying the electrodes, being in close proximity to the welding circuit, were made of gun metal.

The two air cylinders are mounted on a cast-iron bedplate in the back part of the machine. The levers connecting the pistons to the electrode plungers, which are 7 ft. in length, were made of cast steel, in order to obtain the necessary strength.

The maximum welding current for which this machine was designed is 50,000 amp. This current is obtained with 500 volts at 60 cycles applied.

The distance between the electrode bodies for this ma-

Gauge Number	Thickness of Sheets in Fractions of an Inch	Thickness of Sheets in Decimals of an Inch	K. W. Required	H. P. Required	Time in Seconds to Make a Weld	Cost 1000 Welds at one Cent per K. W. Hour
30	1/80	.0125	3.0	4.2	.25	.002
28	1/64	.0156	4.0	5.6	.3	.003
24	1/40	.0250	5.0	7.0	.45	.006
20	3/80	.0375	6.5	9.2	.6	.011
18	1/20	.0500	8.0	11.3	.8	.017
16	1/16	.0626	9.5	13.5	1.0	.026
14	5/64	.0781	10.0	14.2	1.3	.036
12	7/64	.1093	12.0	17.0	1.6	.052
11	1/8	.1250	13.0	18.5	1.7	.061
10	9/64	.1406	14.0	19.9	1.8	.070
9	5/32	.1562	15.0	21.3	1.9	.079
8	11/64	.1715	16.0	22.7	2.0	.088
7	3/16	.1875	17.0	24.1	2.1	.099
6	13/64	.2031	18.0	25.6	2.2	.110
5	7/32	.2187	19.0	27.0	2.4	.124
4	15/64	.2343	20.0	28.4	2.7	.148
3	1/4	.2500	21.0	29.8	3.	.174

As the cost of current varies in different places, we have figured the current at one cent per K. W. hour to give a basis for calculating the cost. Multiply the cost of current given above by the rate per K. W. hour you pay and you will have your cost per 1000 welds for current.

TABLE XXIX. SPOT-WELDING POWER AND COST DATA

chine is fixed at 8 in., center to center, but the distances between the centers of the tips may be easily varied from 6 in. to 10 in. by shifting the tip from the center of the body toward one side or the other.

Provision has been made for shifting the electrodes on their bases to positions 90 deg. from those shown in the pictures, thus spacing the welds in a direction along the axis of the machine instead of traverse to it.

The transformers are insulated and cooled in the same manner as those in the semi-portable machines. The windings are interlaced in order to obtain minimum reactance, the primary being wound in two layers of 14 turns each, one inside and the other outside of the single turn secondary.

With 50,000 amp. in the secondaries of these transformers, the current in the primary is 1,800. The respective current densities are 7,000 and 9,000 amp. per square inch. The kva. entering the transformers on this basis, the two primaries being in series on 500 volts, is 450 for each transformer.

This machine also has been provided with a regulating transformer for applying different voltages to give different values of welding current, and with a panel carrying the necessary selector switches and contactor. The maximum voltage provided by this regulating transformer as at present constructed is 440. If it is found that the current obtained with this voltage is not sufficient for the heaviest work which it is desired to do with this machine, the maximum voltage may be changed to 500.

The kva. entering the transformers at 440 volts will be approximately 350 each, instead of 450.

In order that this machine may be operated from any ordinary power circuit, it will be necessary to use a motor-generator set provided with a suitable flywheel. This will eliminate the bad power-factor, distribute the load equally on the three phases, and over a much larger interval of time for each weld, thus substituting small gradual changes in power for large and sudden changes. On account of the high reactance the welding current will remain practically constant as the speed of the motor-generator set falls away, thus favoring the utilization of the flywheel.

Number of Gauge	Approximate Thickness in Fractions of an Inch	Approximate Thickness in Decimal Parts of an Inch	Weight per Sq. Foot Iron	Number of Gauge	Approximate Thickness in Fractions of an Inch	Approximate Thickness in Decimal Parts of an Inch	Weight per Sq. Foot Iron
30	1–80	.0125	.5	13	3–32	.09375	3.75
29	9–640	.0140625	.5625	12	7–64	.109375	4.375
28	1–64	.015625	.625	11	1–8	.125	5.
27	11–640	.0171875	.6875	10	9–64	.140625	5.625
26	3–160	.01875	.75	9	5–32	.15625	6.25
25	7–320	.021875	.875	8	11–64	.171875	6.875
24	1–40	.025	1.	7	3–16	.1875	7.5
23	9–320	.028125	1.125	6	13–64	.203125	8.125
22	1–32	.03125	1.25	5	7–32	.21875	8.75
21	11–320	.034375	1.375	4	15–64	.234375	9.375
20	3–80	.0375	1.50	3	1–4	.25	10.
19	7–160	.04375	1.75	2	17–64	.265625	10.625
18	1–20	.05	2.	1	9–32	.28125	11.25
17	9–160	.05625	2.25	0	5–16	.3125	12.50
16	1–16	.0625	2.5	00	11–32	.34375	13.75
15	9–128	.0703125	2.8125	000	3–8	.375	15.
14	5–64	.078125	3.125				

TABLE XXX. THICKNESS AND WEIGHT OF SHEET IRON

Decimal Inch	Mill.	Fra In.	B&S	Birm	Decimal Inch	Mill.	Fra In.	B&S	Birm	Decimal Inch	Mill.	Fra In.	B&S	Birm	Decimal Inch	Mill	Fra In.	B&S	Birm	Decimal Inch	Mill.	Fra In.	B&S	Birm	Decimal Inch	Mill.	Fra In.	B&S Gge.	Birm Gge.
.00394	.1				.04525				17	.11443				9	.203125		13/64			.296875		19/64			.40157	10.2			
.00787	.2				.046875		3/64			.11811	3.0				.20431			4		.29921	7.6				.40551	10.3			
.010025			30		.04724	1.2				.12				11	.20472	5.2				.3				1	.40625		13/32		
.011257			29		.049				18	.12204	3.1				.20866	5.3				.30314	7.7				.40944	10.4			
.01181	.3				.05082				16	.125		1/8			.21259	5.4				.30708	7.8				.4096			000	
.012				30	.05118	1.3				.12598	3.2				.21653	5.5				.31102	7.9				.41338	10.5			
.012641			28		.05512	1.4				.12849				8	.21875		7/32			.3125		5/16			.41732	10.6			
.013				29	.05706				15	.12992	3.3				.22				5	.31496	8.0				.42125	10.7			
.014				28	.058				17	.13385	3.4				.22047	5.6				.31889	8.1				.421875		27/64		
.014195			27		.05903	1.5				.134				10	.2244	5.7				.32283	8.2				.425				000
.015625		1/64			.0625		1/16			.13779	3.5				.22834	5.8				.32495				0	.42519	10.8			
.01575	.4				.06299	1.6				.140625		9/64			.22942				3	.32677	8.3				.42913	10.9			
.01594			26		.06408				14	.14173	3.6				.23228	5.9				.328125		21/64			.43307	11.0			
.016				27	.065				16	.14428				7	.234375		15/64			.3307	8.4				.437	11.1			
.0179			25		.06692	1.7				.14566	3.7				.23622	6.0				.33464	8.5				.4375		7/16		
.018				26	.07086	1.8				.148				9	.238				4	.33858	8.6				.44094	11.2			
.01968	.5				.07196				13	.14960	3.8				.24015	6.1				.34				0	.44488	11.3			
.02				25	.072				15	.15354	3.9				.24409	6.2				.34251	8.7				.44881	11.4			
.0201			24		.0748	1.9				.15625		5/32			.24803	6.3				.34375		11/32			.45275	11.5			
.022				24	.078125		5/64			.15748	4.0				.25		1/4			.34645	8.8				.453125		29/64		
.022571			23		.07874	2.0				.16141	4.1				.25196	6.4				.35039	8.9				.454				0000
.02362	.6				.080801				12	.16202				6	.2559	6.5				.35433	9.0				.45669	11.6			
.025			23		.08267	2.1				.165				8	.25763				2	.35826	9.1				.46			0000	
.025347			22		.083				14	.16535	4.2				.250				3	.359375		23/64			.46062	11.7			
.02756	.7				.08661	2.2				.16929	4.3				.25984	6.6				.36220	9.2				.46456	11.8			
.028				22	.09055	2.3				.171875		11/64			.26377	6.7				.3648				00	.4685	11.9			
.02846			21		.09074				11	.17322	4.4				.265625		17/64			.36614	9.3				.46875		15/32		
.03125		1/32			.09375		3/32			.17716	4.5				.26771	6.8				.37007	9.4				.47244	12.0			
.03149	.8				.09448	2.4				.180				7	.27165	6.9				.37401	9.5				.47637	12.1			
.03196			20		.095				13	.1811	4.6				.27559	7.0				.375		3/8			.48031	12.2			
.032				21	.09842	2.5				.18194				5	.27952	7.1				.37795	9.6				.48425	12.3			
.035				20	.10189				10	.18503	4.7				.28125		9/32			.38				00	.484375		31/64		
.03543	.9				.10236	2.6				.1875		3/16			.28346	7.2				.38188	9.7				.48818	12.4			
.03589			19		.10629	2.7				.18897	4.8				.284				2	.38582	9.8				.49212	12.5			
.03937	1.0				.109				12	.19291	4.9				.2874	7.3				.38976	9.9				.49606	12.6			
.04030			18		.109375		7/64			.19685	5.0				.2893				1	.390625		25/64			.49999	12.7			
.042				19	.11023	2.8				.20078	5.1				.29133	7.4				.3937	10.0				.5		1/2		
.0433	1.1				.11417	2.9				.203				6	.29527	7.5				.39763	10.1				.50393	12.8			

TABLE XXXI. DECIMAL EQUIVALENT OF AN INCH FOR MILLIMETERS, B. & S. AND BIRMINGHAM WIRE GAGES

The total maximum power drawn from the circuit with this arrangement would be about 100 kilowatts.

The machine shown in Fig. 427, was built in 1918 by the General Electric Co., in order to investigate the possibilities of welding plates from ½ in. up. Three plates each 1 in. thick have been welded with it. The machine is provided with a 2,000-kva. transformer, having a capacity of 100,000 amp. at 20 volts. Hydraulic pressures up to 36 tons are obtained at the electrodes. Motor-generator sets of 500- and 6,000-kva. capacity were used. From the nature of the service, it was apparent that some form of cooling was needed at the contact points. It was found however, that it was impossible to water-cool the points sufficiently to give a reasonable life to the electrodes if they were kept the same diameter for any distance from the work. In consequence heavy masses of copper were placed as close to the points of contact as practicable. By doing this it was possible to have a very large cooling surface at the top of the electrode and by passing water through this part at the time of welding and between welds, the joints were kept cool enough for all practical purposes.

A portable machine for making mash-welds for splicing or attaching round or square rods cross-wise, is shown in Fig. 428. This was made by the General Electric Co., for ship-yard use.

A big machine for spot-welding electric railway bonds, is shown in Fig. 429. This is made by the Lorain Steel Co., Johnstown, Pa. It will weld two plates 18 in. long and 3 in. wide by 1 in. thick, each plate having three raised "welding bosses." Pressure as high as 35 tons is obtainable and current up to 25,000 amp. may be used.

Spot-Welding Data

It is difficult to give definite costs for spot welding, as much depends on the operator. A careless, or inexperienced operator will waste more current than a good one, and various conditions of the metal being worked on will make a considerable difference at times. However, the information given in Table XXIX, which is furnished by the Winfield Electric Welding Machine Co., will prove of value as a basis for calculations. Tables XXX and XXXI will also be useful to use in connection with the measurement of the thickness of sheets, and in comparing different gages.

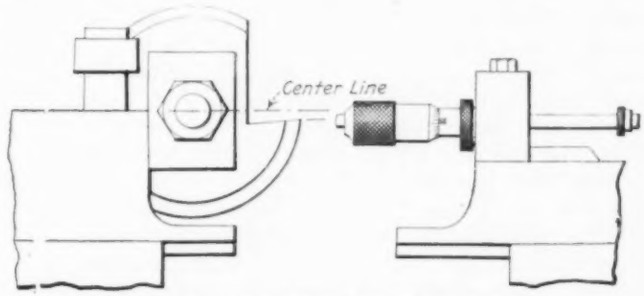
Sizing Forming Tools Without a Formula

By Arthur B. Johnson

It is understood that every automatic screw machine requires that forming tools be cut a certain distance below the center, this distance varying with different machines. To produce accurate work, the relative diameters of the different steps of the tool have to be carefully figured out.

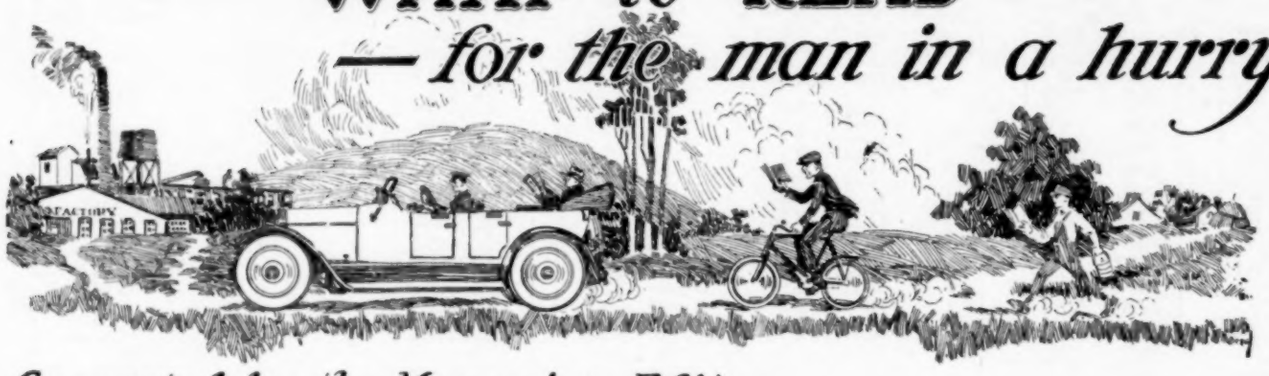
With the method shown by the drawing, you can take the blueprint of the piece to be machined and, with an inside micrometer, set in an adjustable holder the given distance below the center, by working to the surface of the cutter, obtain the same result.

The outside diameter of the forming tool can be of any size convenient, but with the micrometer touching the tool at the required distance below the center, the cutter can be machined until the micrometer registers the same difference in the steps as is desired in the finished product.



SIZING A FORMING TOOL BY MEASUREMENT

WHAT to READ —for the man in a hurry



Suggested by the Managing Editor

STEEL stamps are used for a variety of purposes and their manufacture by hand is probably a familiar feat for most toolmakers. However, as Sheldon remarks in his synopsis of the leading article this week, it is probably not so well known that most steel stamps are made by the same old fashioned process, or a modification thereof. He goes into the details of the manufacture of these articles both on a production and on an emergency order basis. The making of stamps of brass and bronze as well as those of steel is covered and the illustrations show many types of wheel stamps, hand stamps, embossing dies, etc.

What to read was not a difficult matter to decide two hundred years ago when books were few and magazines unheard of. It is far different now when so much reading matter is offered to pass the time pleasantly or profitably as the reader chooses. We are doing our utmost to make the "American Machinist" not only profitable but indispensable as a clearing house of ideas and news of the machinery world. This page is the editors' advertisement of their section of the paper. It gives the high spots.

Fred Colvin is turning his attention for a moment from his beloved automobile shops and on page 795 he tells of some of the ingenious blacksmith tools in use in the Pacific Coast Shops of the Chicago, Milwaukee & St. Paul Railroad at Tacoma, Washington. We cannot but admire the clever makeshifts devised to do the ever varying repair jobs in the old fashioned shops of our moth-eaten railroads. But even so, we feel that it is not only a pity, but almost a national calamity, that the men charged with the maintenance of anything so important as the rolling stock of our railroads should be hampered by the lack of the proper modern tools that would save so much time, money and energy.

On page 798 we begin the first detailed article on cost systems by W. R. Basset. Two weeks ago we gave you the introductory chapter of this second section of "Modern Production Methods," and this week, as we promised, we are getting down to brass tacks. Once again Mr. Basset warns of the dangers of over-doing the red tape end of cost analysis, and shows how the well-designed charge register can simplify matters.

Following the cost article is one that we are reprinting from the *Journal of the Society of Automotive Engineers*, on "Duralumin," the aluminum alloy which has been said to be one of the indispensable factors in the success of the Zeppelin, rigid type airships of Germany. The article was translated from a German treatise by Starr Truscott, of the Bureau of Construction and Repair of the United States Navy. The field opened up by this alloy is astonishingly broad. Consequently we are sure American designers and constructors, draftsmen and mechanics will want to be familiar with its possibilities and behavior under certain conditions.

The final part, No. XXXI, of Viall's welding series begins on page 807 and winds up his series in a blaze of glory. Please do not be dismayed by the length of this installment for although it covers a good many pages a large part of the material consists of illustrations and tables and the "dope" is interesting and worth while. Spot welding machines and their work are described in considerable detail and the fine points of the art of spot welding are covered thoroughly. Those of you who prefer to have this material in handier book form will soon be able to obtain the whole series from the McGraw-Hill Book Co., Inc. This ends Mr. Viall's series but not all we have to say about welding, for we intend to supplement these articles by other individual ones on the developments in the field as they occur. Several are in process at the present time.

This week it is Glenn Quharity who comments in lighter vein on the hard life of the machinist. He takes up once more that much argued question of running the planer table off on the floor. If you don't believe it can be done read his explanation of the "accident" that led to the catastrophe and you will be convinced. Page 828a.

On the next page is a letter from our London correspondent written Oct. 1. He comments on the growth of unemployment in England and the general stagnation of industry which seems to have hit almost every one regardless of locality. The cloud of the impending coal strike which has since burst hangs over everything. An unusually interesting announcement is that of the formation of Atalanta, Ltd., an engineering works, as the British call it, run by women and employing only women operatives. England trained many women in machine operation during the war and apparently some of them like it well enough to keep at it.

Making the Shipper Stay "Put"

By Lew W. Spaulding

One of our workmen, while operating the bolt cutter, had trouble in making the clutch on the countershaft stay in, and, becoming tired of holding the shipper lever by hand, devised the method described below to make it stay "put." So successful was the device that it has since been applied to several clutch-levers and belt-shippers in our shop that refused to stay "in" or "out."

The device is very simple, consisting of a T-shaped piece made by welding together two pieces of ⅜ x 1¼-in. cold-rolled stock, two other pieces of the same material to act as connecting links, and an ordinary coil spring.

The base of the T is to be screwed to the timbers overhead with the projecting piece extending downward in line with, and a little to one side of, the shipper lever. The short link is pivoted to the lower end of the T, and the longer one connects the short link to the lever. The coil spring is then hooked over the projecting end of the lower pivot stud and over another stud specially placed near the angle of the T piece.

It is obvious that when the shipper lever is midway between its extreme positions the link and spring are parallel and there is no tendency for the link to move in either direction even though the spring is under considerable tension. When the lever is thrown either way from the center, the spring shortens and holds the shipper firmly in its extreme position regardless of which way it is moved.

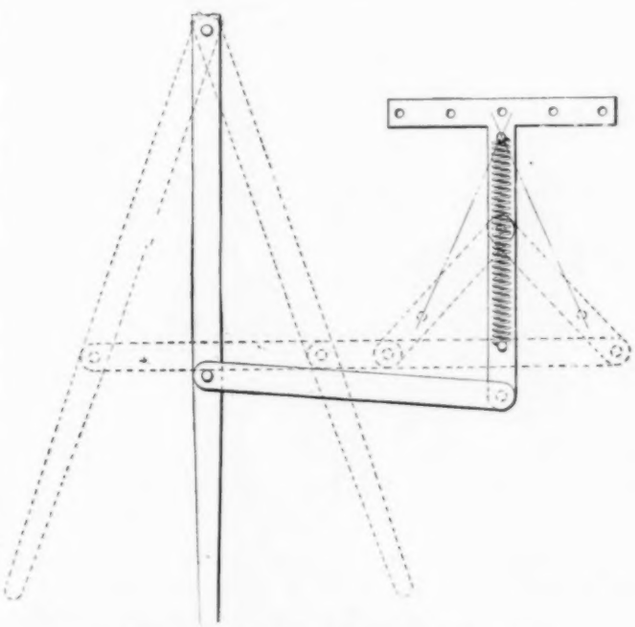
Making a Narrow Belt from a Wider One

By John A. Grill

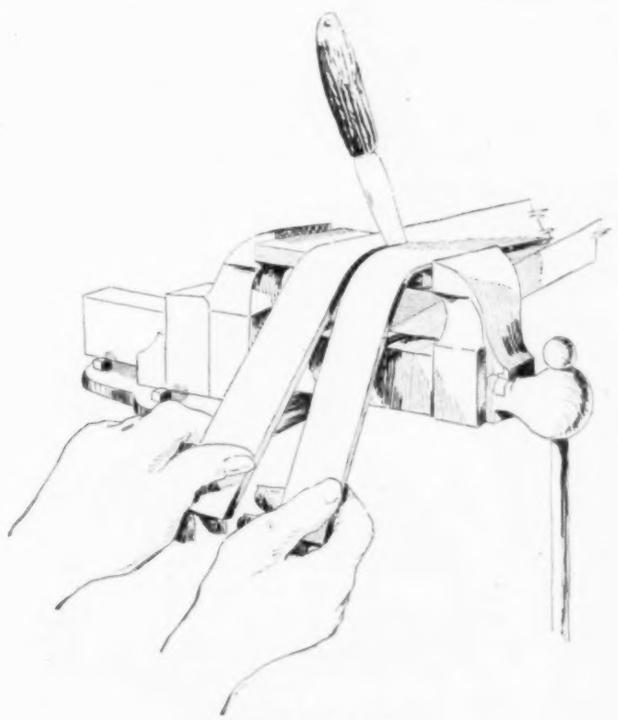
A good way to reduce the width of a belt when a narrow belt is desired in an emergency is to put a block of wood, wider than the belt to be cut, in the bench vise with the surface of the block a little below the level of the jaws. Measure off from one jaw the width of strip of belt desired and drive the blade of a stout jack-knife into the wood.

Starting the cut with another knife, the belt may be quickly drawn through the vise, one jaw guiding the belt and the knife blade shearing it evenly and smoothly the whole length.

This is much easier than laying the belt on a long board and trimming it with knife and straight edge.



HOLDING A CLUTCH LEVER "IN" OR "OUT"



SLITTING A BELT

SHOP EQUIPMENT NEWS

- Edited By -
S. A. HAND

SHOP EQUIPMENT • NEWS •
A weekly review of modern designs and equipment

Descriptions of shop equipment in this section constitute editorial service for which there is no charge. To be eligible for presentation, the article must not have been on the market more than six months and must not have been advertised in this or any previous issue. Owing to the news character of these descriptions it will be impossible to submit them to the manufacturer for approval.

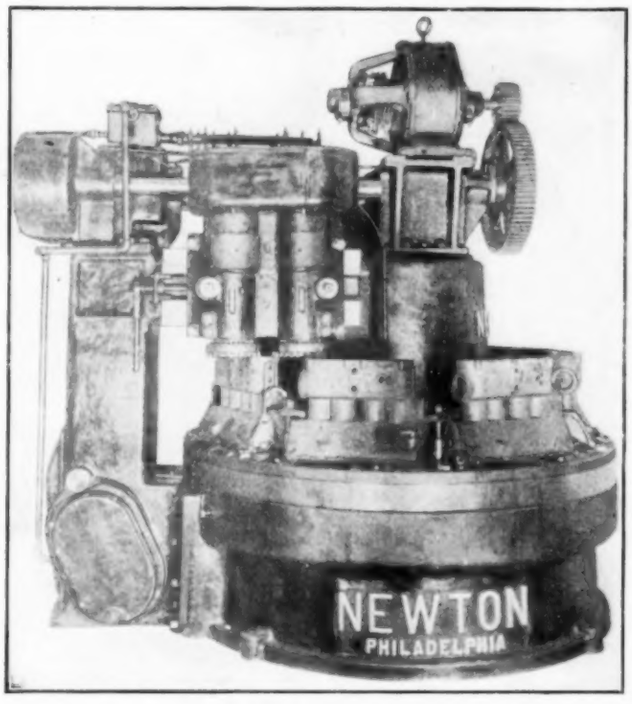
• CONDENSED • CLIPPING INDEX
A continuous record of modern designs and equipment

Newton Ring-Table Continuous Milling Machine

The ring-table type of continuous milling machine shown in the illustration is built by the Newton Machine Tool Works, Inc., 23rd and Vine Sts., Philadelphia, Pa. It is known by its maker as the second-model continuous milling machine.

The base is circular in form and is provided with a tapered column in the center. The table is fitted to the column and in addition is provided with an annular bearing close to its periphery. It is 84 in. in diameter, and the thickness from the annular bearing to the top is 12 in. The least diameter of the taper bearing between the column and the table is 36 in. The table is provided with a finished hub 42 in. in diameter to assist in locating jigs.

The central column is bolted and keyed to the base. The cross-rail and the central upright are made in one piece so as to reduce the number of bolted connections. The outer end of the cross-rail is supported by a column which is bolted and doweled to an extension of the base. The cross-rail is fitted in the front with a saddle carrying two spindles for roughing. On the back of the cross-rail is a similar saddle carrying a single spindle for the finishing cutter. The saddles for both the roughing and finishing spindles can be moved on the cross-rail, so that the spindles can be positioned to suit the work being done.



NEWTON RING-TABLE CONTINUOUS MILLING MACHINE

The drive mechanism is located on the top of the machine, a motor on the central upright being geared to a jackshaft entering the gear box on the outer column. The jackshaft is geared to the horizontal shafts, driving the roughing and finishing spindles through worm gearing. This permits independent variation of the rotative speeds of the spindles when the grade of material or size of the cutter is changed, although the speed is pre-determined and fixed for each job.

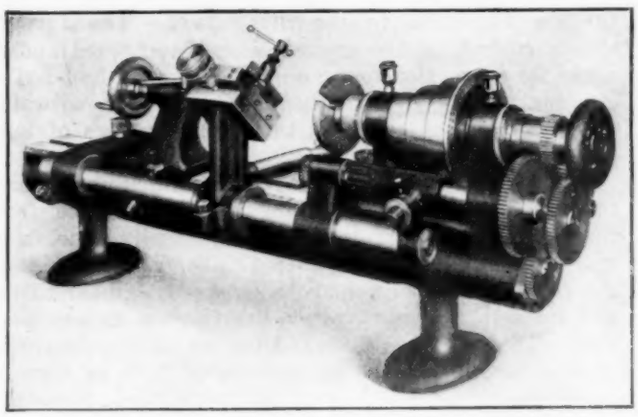
The speed of rotation of the table is also fixed for each job, but provision is supplied by which this rate of feed can be changed to suit any change in the grade of material. The operator cannot increase or decrease the pre-determined production of the machine without attracting attention. A clutch is provided for disengaging the table-driving mechanism. The table itself is rotated by means of a pinion engaging a herringbone gear 81 in. in diameter.

Different saddles providing different center distances between the roughing spindles can be furnished to suit the work. Generally the distance is either 12 or 14 in. The roughing spindles are rotated in opposite directions, the direction being clockwise for the left-hand spindle and counter-clockwise for the right-hand spindle. The distance from the centers of the roughing cutters to the center of the finishing cutter is 42 in., so that the roughing operation can be completed on a casting before the finishing operation commences. Only a very light finishing cut is taken. The spindles are independently adjustable for height. It is claimed that very rapid production is obtainable, because roughing and finishing are done at the same time.

All bearings, except the spindle bearings, are oiled by the cascade method, the oil being pumped from a reservoir in the outer upright to the box on the top of the machine, from which point it is distributed. The bearings are sealed to prevent the escape of lubricating oil and all gears are inclosed and run in oil.

Potter Thread-Chasing Attachment for Bench Lathe

For attachment to its bench lathes, the S. A. Potter Tool and Machine Co., 77 East 130th St., New York, N. Y., has recently placed on the market the thread-chasing fixture shown in the illustration. It is claimed



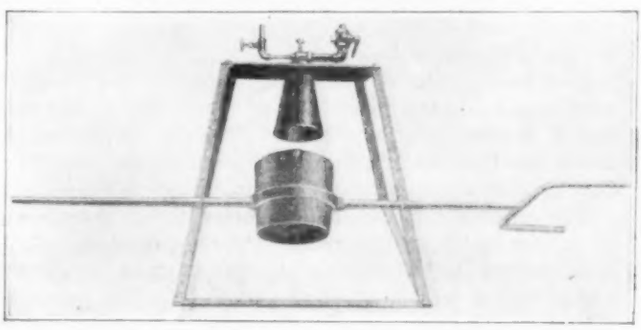
REAR VIEW OF POTTER BENCH LATHE WITH THREAD-CUTTING ATTACHMENT

that the fixture can be readily attached, fitting both the No. 5 and No. 7 lathes. It will cut threads up to 5 in. long with leads from 4 to 84 threads per inch.

The lead screw is mounted on a shaft carried in brackets at the rear of the headstock, and is driven by a train of gears from the spindle. A short section of the screw is fluted to form a hob for cutting the bronze lead-nut when necessary. The toolholder is mounted on a slide which is provided with screw adjustment and a graduated feed dial. The slide swings on a frame mounted on the chasing bar back of the bed. The tool can thus be disengaged from the cut and returned to the starting position without stopping or reversing the work. The nut, which consists of a bronze bar suitably mounted in an arm on the chaser bar, is thus out of contact with the screw when the tool is away from the work. It engages the nut again as the tool is brought into its cutting position. The proper position of the tool frame for cutting is obtained by keeping the handle of it in contact with the hardened plate placed on the bed of the lathe. It is claimed that threads can be chased very rapidly on light work by this method. Hobs and screws for various leads, either English or metric, can be furnished.

Wayne Pouring Ladle Heater

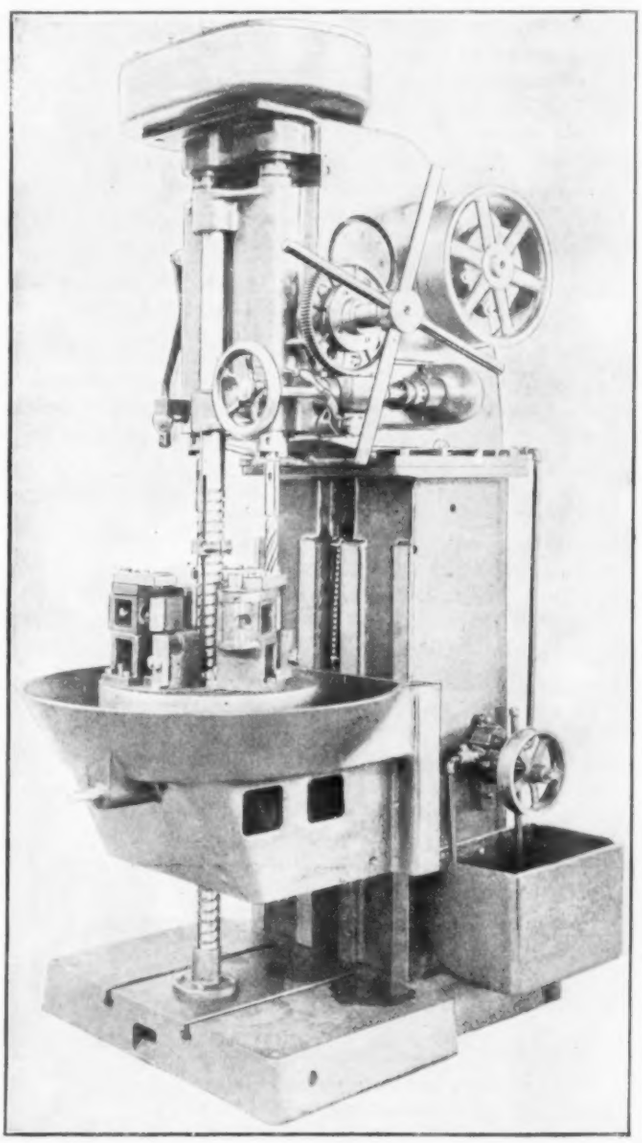
For use in connection with tilting crucible and non-crucible melting furnaces the Wayne Oil Tank and Pump Co., Fort Wayne, Ind., is building the No. 3085 ladle heater shown in the illustration. It consists of a frame upon which the ladle may be supported at various heights. There is mounted, on the top plate of the frame, an inverted burner with a cone-shaped hood to blow the flame into the ladle. The burner is designed for connection to the regular oil or gas supply lines and uses oil at 5 lb. or more pressure and air at 1½ lb.



WAYNE NO. 3085 LADLE HEATER

Baker No. 220 Two-Spindle Drilling Machine

A recent addition to the line of Baker Bros., Toledo, Ohio, is the No. 220 two-spindle drilling machine illustrated. It is built as a single-purpose production tool for successive operations and can be used for drilling, boring, counterboring, reaming, facing, etc. The indexing table affords two work stations and a loading station. The rated capacity of the machine is 2-in. diameter for high-speed drilling. The spindle centers are 10½ in. apart. The length of down feed is 12 in. Changes of spindle speed can be had by changing slip gears in the gear box on the side of the machine. These speed changes are independent for each spindle. The feed-works are the same as on the standard Baker drilling machines. The screw that extends through the center of the table is for aligning the table, raising and lowering it and locating it in the desired position. It also furnishes support to the table. The worktable revolves on ball-thrust bearings, is indexed by hand and is located in position by a hardened steel plug.



BAKER NO. 220 TWO-SPINDLE DRILLING MACHINE

Specifications: Speeds and feeds built to suit job. Weight, 5,200 lb. Floor space, belt drive, 31 x 42 in.; motor drive, 31 x 66 in. Motor, 10 to 15 hp. Height, 8½ ft.

"Weldrite" A.C. Electric Welding Machine

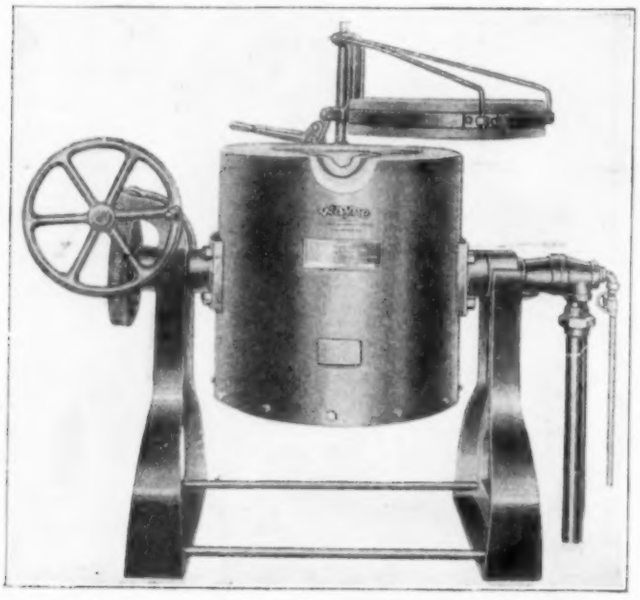
The Weldrite electric welding machine is built by the Electric Welding Machine Co., 500 E. Larned St., Detroit, Mich. The company recommends this device particularly for electric welding of cast-iron and repair work in machine shops and foundries. It uses a short drawn arc which, it is claimed, eliminates the necessity of pre-heating the work. The device is built without moving parts and, it is claimed, is so designed that the delivery of voltage and amperage to the work remains substantially constant for any given setting, thus maintaining a uniform degree of heat in the arc.

"WELDRITE" A.C. ELECTRIC WELDING MACHINE

The machines are built to be operated on 110, 220 or 440-volt alternating-current, indoors or out, where access can be had to an electric circuit of 75 amp. capacity. They are portable, the largest type weighing about 300 lb. All are mounted on ball-bearing casters.

Wayne Tilting Crucible-Type Oil-Burning Furnace

The Wayne Oil Tank and Pump Co., Fort Wayne, Ind., announces as additions to its line of industrial furnaces, the No. 3015 tilting crucible-type, oil-burning furnace as shown in the illustration. The furnace stands entirely above ground, is self-contained and is ready for connection to the oil and air supply lines. The crucible remains constantly in the furnace with the object of not subjecting it to sudden changes of temperature, nor to rough handling by tongs.



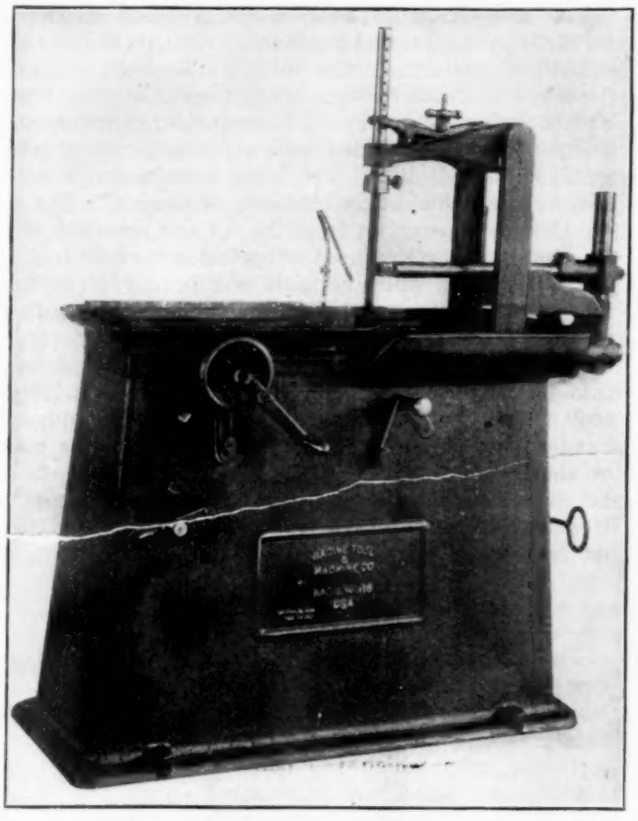
WAYNE NO. 3015 TILTING CRUCIBLE-TYPE OIL-BURNING FURNACE

Specifications—Three sizes, Nos. 3, 6 and 9. Respective capacities, 200, 350 and 750 lb. Average heats per day, 6 to 10, 5 to 9, 3 to 5. Floor space, 36 x 66 in., 39 x 68 in., 42 x 70 in. Height to cover, 3 ft. 8 in., 3 ft. 10 in. and 4 ft. Air pipe connections, 2, 2½ and 3 in. Oil pipe connections, ½ in. Air volume required, 200, 250 and 400 cu.ft. per minute. Shipping weights, complete, 2,000, 2,500 and 3,000 lb.

The flame from the burner strikes a stool upon which the crucible stands, thus relieving the crucible from the cutting action of the flame. If desired the flame may be continued while pouring. The cover tilts with the furnace. A worm-gear drive is provided for tilting and its action serves to lock the furnace in any position. The burner is designed for air at a pressure of from 1 to 2 lb. and oil at pressure of 5 lb. or more.

Racine No. 25 Slotting Machine

The Racine Tool and Machine Co., Racine, Wis., has redesigned its No. 25 slotting machine. The original machine was described in detail in *American Machinist*, Vol. 49, page 953. The redesigned machine is shown in the illustration.



RACINE NO. 25 SLOTTING MACHINE

Specifications—Table, 12 x 27 in. Strokes per minute, 60. Length of stroke, 7 in. Drive pulleys, 3 x 10 in. Pulley speed, 750 r.p.m. Net weight, 2,000 lb. Floor space, 26½ x 57 in. Height overall, 58 in. Power required, 2 hp.

The base contains the main working parts of the mechanism and the reservoir for the coolant. The table has a slotted hole lengthwise through its center for about one-half its length which permits the table to be fed for that distance into the cutting tool.

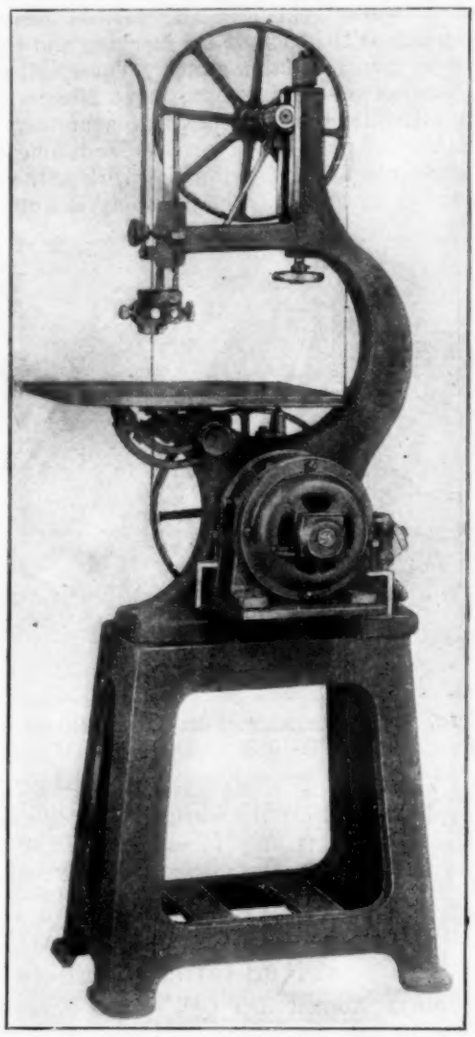
The cutting tool can be supported by an overarm or by a bracket from the rear. Its reciprocating motion is imparted by a crank-disk operating a connecting rod giving a length of stroke of 7 in. The periphery of the crank-disk serves as a cam for actuating the feed and release mechanism of the table. Feeding pres-

sure exists only during the cutting stroke as the tool is relieved from the work on its return stroke. The feed is not positive but is governed by a spring-controlled lever and the pressure of the spring and consequent rate of feed of the table are regulated by a hand lever on the front of the table. The thrust against the cutting tools is counteracted by the support of a bar which carries a small roller that fits in a spline cut in the back of the tool. The cutter coolant is circulated by a small belt-driven pump.

The machine is furnished either with tight and loose pulleys for belt-drive or with a tight pulley only for motor drive.

West Side Junior Bench Bandsaw

The illustration shows the 14-in. bench bandsaw built by the West Side Iron Works, Grand Rapids, Mich. It was designed particularly for the service of pattern shops, furniture factories, manual training schools and jobbing shops and can be used as a portable machine



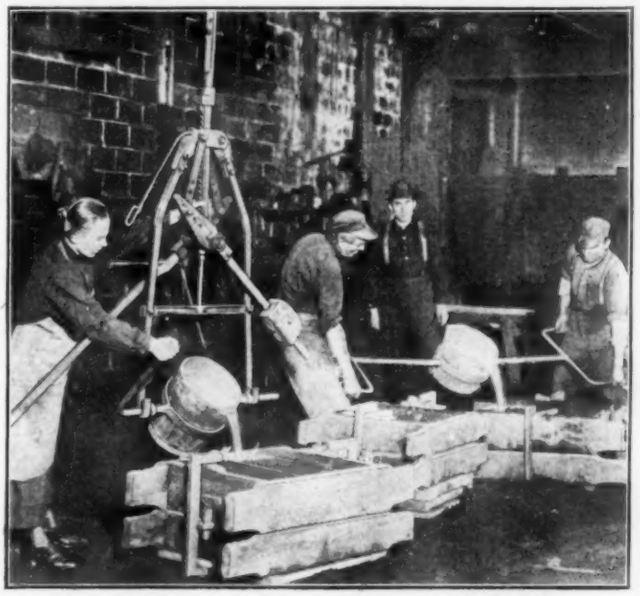
WEST SIDE 14-IN. BANDSAW

or mounted on a bench when not furnished with the pedestal.

The machine is furnished either for belt or motor drive. The belt drive pulley is 5½ x 1¼ in. The frame is a one-piece cored casting, carrying self-oiling bearings for the shafts. The wheels are 14 in. in diameter with 1 in. face and are covered with rubber bands. The shaft of the upper wheel runs in a double yoke-box and has a tilting device for shifting the saw-blade to the desired path. The table is 16½ x 19 in., is finish-planed and can be tilted to any angle up to 45 deg. The over-all height without pedestal is 3 ft. 6 in.

Woodison Mechanical Pouring Device

The illustration herewith shows the relative advantages of the pouring device, brought out by the E. J. Woodison Co., Detroit, Mich., over the old style method.



WOODISON MECHANICAL POURING DEVICE

The pouring is said to be more accurate, with fewer spills and accidents. Adjustable levers and a counterweight enable ladle capacities of over 400 lb. to be lifted 18 inches.

Arnold Type "C" Portable Electric Drill

The portable electric drill shown in the illustration has recently been placed on the market by the Arnold Electric Tool Co., Inc., New London, Conn., and 114 Liberty St., New York. The drill, known as type "C," has a ¼-hp. motor and an idle speed of 480 r.p.m. It is claimed to have a capacity for drilling ½ in. in steel and ¾ in. in wood or brass.

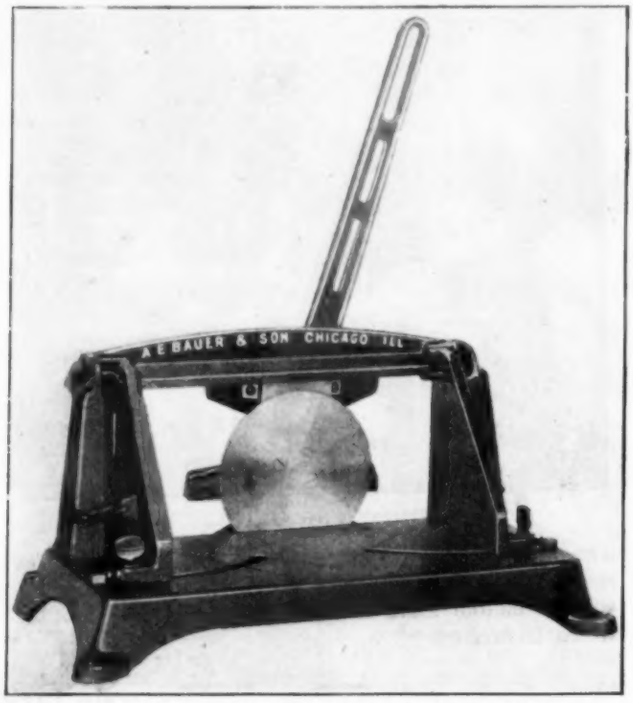
The motor operates on both a.c. and d.c. current of 110 to 120 volts, although machines can be furnished for other voltages. It is claimed that the tool is very simply constructed. Each section can be removed as a unit. By removing the upper housing the commutator can be cleaned while the motor is running. The gear housing can be removed without disturbing the motor. The lower housing can be removed without disturbing the gear housing, thus enabling the armature to be taken out of the motor housing with the gear train intact.

ARNOLD TYPE "C" PORTABLE ELECTRIC DRILL

The housing is made of aluminum. There are five sets of ball bearings holding the rotating parts. The switch is located in the side handle. The breastplate and the spade handle are interchangeable. Screw feed and "old-man" attachments can be furnished, thus enabling the tool to be used as a bench drill. The over-all length of the tool is 16½ in. and the weight 13½ lb.

Bauer Revolving Knife Wood Trimmer

The illustration shows the revolving knife wood trimmer made by A. E. Bauer & Son, 7021 S. Racine Ave., Chicago, Ill. It is claimed that the revolving knife cuts instead of crushes off the wood, making a



BAUER REVOLVING KNIFE WOOD TRIMMER

Specifications: Length overall, 17⅜ in. Width overall, 11 in. Height (without handle) 9 in. Maximum length of cut, 7¼ in. Maximum height of cut, 2¼ in. Diameter of knife, 5¼ in. Weight, 40 lb.

straight, smooth cut with a polished surface effect on any kind of wood. The total cutting edge of the knife is 16½ in.

The guides at the ends can be set at any angle up to 45 deg. and 45, 60 and 90 deg. angles are marked on the base of the machine. There is an attachment to be used when grinding the knife.

Davis No. 1 Continuous Duplex Four-Spindle Milling Machine

The milling machine illustrated in Fig. 1 is a late product of the Davis & Thompson Co., 251 Reed St., Milwaukee, Wis., and is intended for continuous end milling and milling to length.

In each head are two cutter spindles having an endwise micrometer adjustment of 2 in. and provision for locking them in place after adjustment. The right-hand head is adjustable on the bed, permitting milling various lengths up to the capacity of the machine. The work is held in a revolving fixture as shown and the cutters are so located that the front ones do the roughing and the back ones the finishing.

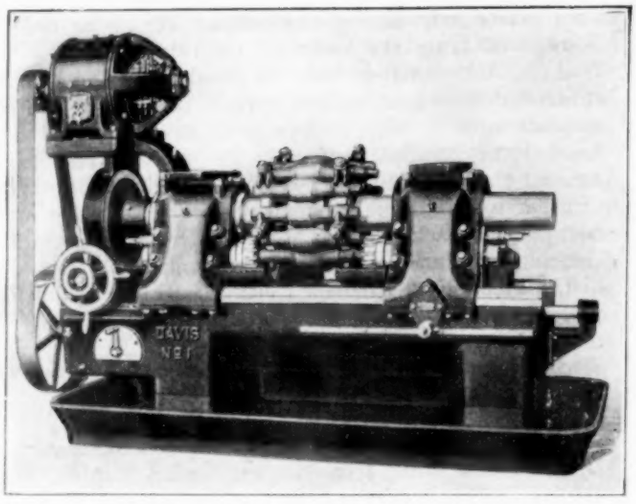


FIG. 1. DAVIS CONTINUOUS DUPLEX MILLING MACHINE

The work mandrel is supported in both heads and is rotated by worm gearing. The various feeds are by change gears at the back of the machine and the feed is engaged by a cone friction clutch. The speed gears are enclosed in an oil-tight compartment filled with transmission oil while the lubrication of gears and spindles is taken care of by oil reservoirs inside the heads.

An attachment for carrying the work without clamping is shown in Fig. 2. The clamping is automatically

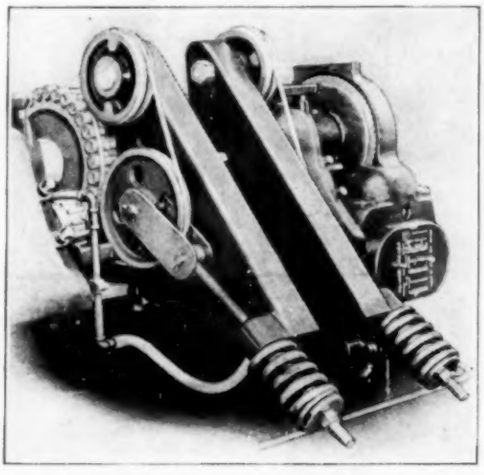


FIG. 2. ATTACHMENT FOR CARRYING WORK WITHOUT CLAMPING

done by endless wire ropes passing over sheaves and being held taut against the work by stiff springs. With this attachment it is only necessary for the operator to put in and take out the pieces at the proper station.

The Fourth Roll Call of the American Red Cross

The Fourth Annual Roll Call of the American Red Cross will be held from Nov. 11 to 25. It is neither a campaign nor a drive; it is simply the time set aside for all members to pay their dues and renew their memberships, and for new members to join. The dues are one dollar. If you are in sympathy with what the Red Cross is doing for public health in this country, for the 26,000 wounded soldiers still in hospitals and for the millions of sick and starving people in Eastern Europe, you will want to join.

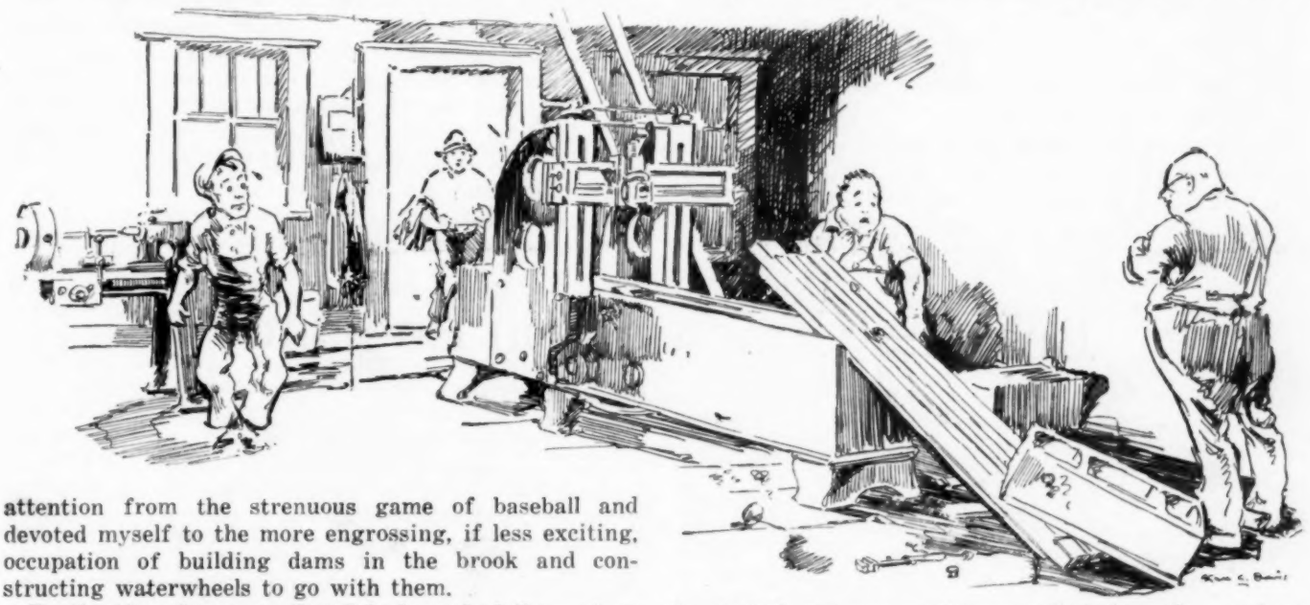
Pipe Dreams of a Tramp Machinist—Boys Will Be Boys

By Glenn Quharity

A contributor to the *American Machinist* said some time ago, I do not remember in what issue, that he did not believe it possible for a planer table, or platen, to run off on the floor. I cannot share his belief for the reason that very early in my career I not only witnessed such a catastrophe, but had a guilty hand in the causes which led up to it.

I haven't the least idea when or by whom the great American institution of baseball was invented but it must have happened long before I did, for one of my earliest recollections is of getting a baseball on the end of my nose while watching the "boys from Brookses" play "three ol' cat" in the field adjoining the Brookdell Shops. It must have been a very "soft" ball, suited to my tender years—and nose—else the latter would now be a dimple.

For a few days after that event I withdrew my attention from the strenuous game of baseball and devoted myself to the more engrossing, if less exciting, occupation of building dams in the brook and constructing waterwheels to go with them.



By the time, however, that I had reached the mature age of 16 years and was serving my time in the machine-room with some of the same men that had helped to bust my nose, I had regained my interest in baseball and during the season used to hurry back from my dinner each noon for a few minutes of ball tossing and whacking before being whistled into the shop by Bill Shailer's relentless hand on the whistle cord.

Given a dozen or more men or boys engrossed in ball playing and summon them to the sterner duties of life, though they respond conscientiously enough, it is too much to expect that their thoughts will be instantly transferred from sport to the work in hand, and so it would not be strange if there were more or less horseplay after dinner before the boys finally settled down to the afternoon's routine.

Especially if two or three boys happened to have "cuts" on lathe, planer, or shaper (and it was wonderful, the facility with which this condition could be arranged for just before noon) so that their immediate duties after one o'clock were satisfactorily discharged by simply throwing the shipper, there would be more or less surreptitious tossing of balls back and forth across the room between the belts, posts and other obstructions; which latter included workmen who did not care for baseball.

One warm afternoon, after reluctantly obeying Bill's clarion call, several of us boys found (much to our surprise) that all we had to do to get to work was to start up our machines and throw in the feed. I had a big bronze bushing in the lathe chuck and was boring it out by my favorite method of turning the tool bottom side up, running the lathe backward, and feeding toward the tailstock. (Did you ever try it? "Charlie" Pratt taught me the trick and it is astonishing how it will quiet a "chattery" lathe on such jobs).

Fortunately, as I thought, the cut had just been started. It had taken a deal of grinding and setting to get that tool in just the right position at twelve o'clock, but I did it, and so this afternoon I had nothing to worry about until the tool had traversed the 14-in. length of a 10-in. diameter bushing. Further, if I didn't happen to notice it at the exact instant that the tool came out of the work, why, it was a long bed lathe, and somebody would probably call my attention to the fact that I was "cutting wind" before the carriage reached the tailstock.

Fatty (*not* Fatty Arbuckle) was running the old planer down in the dark corner of the room. (Fatty was so called because of his avoirdupois; at the age of 17 years he was 5 ft. 4 in. high and weighed 174 lb.) He was a wizard (for a second year boy) on the old planer, and though he didn't like it very well, much preferring the new milling machine up near the boss' desk, he used to be assigned to it quite often; "just out of pure cussedness" he was wont to grumble.

The old planer, which I think was built by the Phoenix Iron Works of Hartford, Conn., had a comparatively short bed, with a table that, though short in itself, was long by comparison. It had four pulleys on the first shaft and only one belt, which drove first the outside pulley and then the inside one as the table travelled back and forth, the belt at each reversal passing across two loose pulleys placed between the tight ones.

Fatty was planing up the edges of a large iron flask which covered nearly the entire surface of planer table. "Just as good a job," says Fatty, "as if it was solid—

it lasts just as long and you don't have to grind the tool so often."

"Bunk" was running the milling machine (Bunk didn't mean the same thing then that it does now, and was not a term of opprobrium). He was cutting a rachet—a job that Fatty had wanted—and had his hands free only at intervals.

The boss not having shown up after dinner, Fatty and I were passing the ball back and forth across the room while Bunk looked on with envy from the opposite corner. Catching the ball at a moment when Bunk had his hands free, I sent it spinning down the long line of lathes, just missing the heads of half a dozen men who had just as soon have soused me in the brook as not, to where Bunk stood with hands up ready to receive it. Making a neat catch, Bunk instantly shot the ball diagonally across the room to Fatty who, somewhat confused by the new direction, muffed it and allowed it to fall into the reversing mechanism of the planer at a most psychological moment.

I say psychological advisedly. The planer table had arrived at the end of its reverse stroke; Tom Jones, the boss, had just blown in at the back door, which was nearest his house; Mr. Brooks, our principal owner and executive, had chosen that exact moment to frame his portly presence in the doorway leading through the shop to the office.

The ball having jammed the levers of the planer, the belt stopped on the loose pulleys, but the table did not stop. Oh No! It kept right on going until the end overbalanced, then it stood up endwise, the holding straps which Fatty had used to fasten down the job were not equal to the strain from the new angle, and the 500-lb. casting toppled over at the feet of Mr. Brooks, ending the rattle and crash of falling tools and bolts with a thud that shook the rafters.

Everybody (except Bunk and I) looked at everybody else, and Fatty with his hair standing on end, looked at all of them. Both Bunk and myself were so completely absorbed in our work that one glance was sufficient to disclose the culprits to Tom and Mr. Brooks.

Inventory was taken of the damage (which was slight) and then, obeying a significant crook of the "old man's" finger three crestfallen lads marched off to the office to listen to a long and solemn admonition against the evils of thoughtlessness, carelessness, and inattention to business; concluding with an estimate of the direful things that *might* have happened had not a wise and beneficient Providence, of which we were entirely undeserving, intervened.

Mr. Brooks did not scold; he was too wise to the ways of boyhood to do that; but he had a masterful way of bringing home to boys a realization of the enormity of their offenses; the fulness of forbearance displayed by their elders, and the wonderful things that were sure to result if they placed Business before Pleasure and made the most of their opportunities.

We three boys went back to our respective jobs with the feeling that our old man was the best old man in the world and that we (with reservations) were the meanest and least deserving of his creatures. I wonder if labor agitators, and other people who live by making trouble for others, would not have a harder row to hoe if there were more employers like our "old man?"

Business Conditions in England

FROM OUR LONDON CORRESPONDENT

LONDON, Oct. 1, 1920.

MOST people are now ready to admit that Great Britain has entered on a period of decreasing employment. For this various reasons are adduced, strikes and fears of labor disputes being prominent. Everybody was relieved when the coal strike was postponed, if only for a week. Most people were confident—wrongly, as it turned out—that in that period a satisfactory working arrangement could be reached as the result of the series of conferences between representatives of coal owners and workmen. The demand for the reduction of 14s. 2d. in the price of household coal is of course withdrawn, but the claim for a 2s. per shift wage advance is persisted in. Agreement will probably depend on whether the miners continue to claim this advance without conditions, or whether they will allow it to be dependent on a really, and not merely camouflaged, increased output.

Decline shows itself clearly in shipbuilding and engineering, in the textile trade, in the shoe industry, and to some extent in drapery and furniture. On the Clyde unemployment is increasing, and about 3,500 shipyard workers and 1,500 engineering workmen are said to be looking for jobs. South Wales is another area of increasing unemployment in the metal trades, and engineering firms in the Openshaw district of Manchester are dividing their forces into halves, each working alternate weeks.

THE MOTOR INDUSTRY

The condition of the motor industry has long been a subject of general and, it may be added, not always instructive conversation. Receiverships and imminent failures generally have been freely asserted. The stoppage of the Sopwith firm, maker of the A.B.C. motorcycles, and the shutting down of the Vulcan branch of the Harper-Bean combination, are about all that at present need be noted. But unemployment in this section of the engineering industry grows, and of all things which can be imagined overproduction has been adduced as the cause. Not long ago the position was that one could not possibly get delivery; now customers are much more likely to forfeit deposits and refuse to accept cars. The coming change in the basis of taxation—from petrol to power of engine—will probably not ease conditions. The decline in the French automobile industry is described as almost catastrophic. In Great Britain several instances of price reduction have been announced, the latest being Vauxhall Motors, Ltd., which reduced the price of its 25-hp. car (now £1,450) by £300, and of its 39- to 98-hp. cars (now £1,675) by £285.

What, it seems, will not be generally recognized is that high prices are the cause of the decline. High prices are largely the result of high costs of production. Taxation, both national and local, has a crippling effect, and the high cost of labor shows itself again in the price of so-called raw materials. Then, too, while the rate of production has sunk, credit and currency have multiplied. How to reduce labor costs is the problem, the solution to which is by no means obvious. Reduction of wages is not usually even hinted at. Instead, higher production is pressed for, if that is the right phrase.

HIGH PRICES HAVE LED TO DECLINE OF DEMAND

High prices have at last led to decline of demand and the only obvious stimulus is their reduction. The whole subject was discussed at a special conference held last week at Olympia, W., during the run of the machine-tool and engineering exhibition. Here G. N. Barnes read a paper on un-

employment, production, etc., under the auspices of the Industrial League and Council, an organization that exists for the purpose of bringing employer and employed together with a view to harmonious working. The conference was attended by about 250 people, a large proportion of whom were delegates—somewhat youthful—from the Amalgamated Engineering Union. The latter almost without exception urged control of the industry by workpeople and it is evident that the Italian example is being watched very carefully.

This does not imply more opposition to industry; the purpose is to reconstruct industry on a new basis.

In the same hall a conference was held the next day on safety first in factories. Here G. Bellhouse, deputy chief inspector of factories, drew attention to the example of America, which, he suggested, by the experience of some twelve years showed that with proper safety organization three-quarters of all accidental injuries could be eliminated. This will not be readily accepted as applying in the same proportion to Great Britain. The Home Office here, through its factory inspection department, has always paid very close attention to the safeguarding of machinery and to anything else likely to prevent accidents in workshops and factories. To take an example, it was only the insistence a few years ago of the factory inspectors that overcame the objection of certain machine-tool manufacturers to the guarding of cutters on milling machines.

The Machine-Tool Exhibition

The machine-tool exhibition as a show of machine tools was undoubtedly a success. Good design and finish were evident in the standard tools which were displayed prominently by British makers. It was clear, too, that, to take a detail, the production of abrasive wheels is extending in England, and a marked feature was the considerable number of gaging and measuring appliances for the engineering workshop as made by firms for whom Alfred Herbert, Ltd., acts as agents, and by others too. Note may be made of the glass surface plates by Leonard & Co., Ltd., Croydon, guaranteed to within 0.000025 in. The thickness of the glass is from ¾ in. to 1¼ in., according to size of plate, the standard sizes at present ranging from 6 in. by 4½ in. to 24 in. by 19 in. The glass, it is asserted, will not mature or distort with passage of time and is immune from effects of temperature changes, at least as common in the workshop.

Among the Swedish tools was one pronounced copy of an American production: but for the most part the machine tools from Scandinavia were of standard form. Exception can be made of the Bergstrom four-cutter semi-automatic machine for grooving and backing-off two-lip twist drills, in sizes up to 1¼ in. in diameter; a ⅛-in. high-speed steel drill 3 in. long on the flutes, for instance, being grooved and backed-off in two minutes. The American tools shown—milling and grinding machines may be mentioned—certainly prevented any tendency on the part of the British maker to mere self-satisfaction.

Commercial Results of the Exhibition

As to the commercial results of the exhibition, opinions are naturally somewhat conflicting. The writer knows of relatively small and new firms who certainly did well, more particularly during the first week or fortnight. One firm with a fairly large stand sold it four times over the first ten or twelve days and then did practically nothing. Several of the larger firms were not particularly enthusiastic, though of course many inquiries have been received which may bear good results. The promoters certainly did their best to insure that the exhibition should be visited. Apart from advertising, both in Great Britain and on the European continent, they sent out 12,000 invitations all over the world, and engineers attended from France, Belgium, Switzerland, Holland and Scandinavia. Overseas Britain sent many representatives; in fact one exhibitor concluded that the population of Australia is about five millions—all machinery agents.

From today onward rates of wages in Great Britain will be a matter for direct settlement between employers and employed, but with the agreement of both parties an industrial court may arbitrate. Whitley councils are of course trade courts at which such matters are discussed; in fact in some instances the chief work of these councils so far has been the settlement of the exact amount of increase to be made in wages rates. They can if they choose go a good deal further, and enthusiasts have suggested these councils as a means of settling all the problems incidental to employment. They suffer however from a serious defect, being incompletely representative. Apart from other points, consumers are not represented. In short, to take wages only, by agreement these have in many instances been raised, this applying also to prices. In the end, as was suggested at the luncheon held during the course of the conference on unemployment mentioned, something like a general strike has been entered into by the consumers, and a declining demand is leading to lessening employment. As to wages, engineering workpeople have been making claims for another 6d. an hour, with a corresponding increase in piece rates; the matter has yet to be decided. Conferences have been held on overtime working and similar affairs and seem likely to be settled amicably on a national basis.

Women Workers Employed Entirely by a New Firm

The prospectus of Atalanta, Ltd., is shortly to be issued, the company being in the process of formation, with a factory in the Midlands to undertake engineering work. It will be run completely by women, though it would seem that the directors are to include mere males. Machinery is now being ordered and it is expected that work will be started in the course of a few weeks. We have here a Women's Engineering Society, and Miss C. Hazlett, its secretary, has stated that Atalanta, Ltd., has accepted a sub-contract for the machining of parts of a new pump ordered by the French government and that work in connection with hosiery needles will also be undertaken. Apparently a works in Scotland, where women received regular engineering training during some years of the war, is to be drawn on for personnel, with other women workers who have had experience in machining operations in munition factories. All the employees will be shareholders. No one would assert that the women who were so usefully engaged in engineering workshops during the war period have been generously treated. They have been discharged to make room for the returning male worker and where attempts have been made to retain the women legal means have been sought, with success, for removing them. The firm of Atalanta, Ltd., is intended to give women freedom to use such engineering ability and skill as they may possess. The works will commence operation on a small scale, but will be extended as required.

Meanwhile as regards the employment of women in industry, mention may be made of the fact that the factory inspection department of the Home Office is apparently being reorganized and that the twenty-one women inspectors will shortly receive additions to their numbers. Further changes are anticipated in the direction of putting women on an equality with men. Then as regards women in the civil service, the post of director of women's establishments has been instituted and the chief woman inspector to the Board of Education has, in fact, been appointed to the position.

British revenue returns for the first half of the current financial year have been published today and indicate a total revenue during the six months of £619,299,498. The increase as compared with the same period last year is rather more than 160 millions, but the sum of more than 115 millions obtained from the sale of war stores is included. The excise returns, £88,846,000, represent an increase of no less than £37,621,000, but customs receipts are lower by 4 millions, their total being £67,834,000. Property and income tax returns increased by about £16,818,000, but a decline is shown in excess profits duty of £20,487,000. Property and income tax, etc., in fact raised £126,335,000, and excess profits duty £109,400,000. During the past half year the net reduction in the floating debt amounted to £30,297,000, and the net sales of war savings certificates amounted to £3,450,000.

The Leipzig Technical Fair and the Outlook of the German Machine Industry

Few Deals Were Closed at Fair—Difficulties Encountered in Executing Large Foreign Orders Placed a Year Ago—Outlook Not Favorable

The Leipzig fair is over—and its result may be considered a true reflection of the present trend of business in Germany. No effort was spared by the management to attract both inland and foreign visitors and an extensive and well-organized propaganda campaign was carried to that end. It would be misleading, however, to assume that industrial circles were under a delusion when planning the fair, for it was almost universally realized that in view of the obtaining stagnation of business in Germany, no great volume of business could be expected and it is no exaggeration to state that the recognition of the aforementioned fact determined the whole character of the fair. The unabating stagnation of business and the steadily increasing cancellations of foreign orders rendered a rally of the German industries absolutely imperative. A demonstration of the productive capacity and efficiency of the German machine industry was needed and the Leipzig Technical Fair was considered an ideal medium. From a purely organizing and exhibitive point of view the Fair was a brilliant success; from the business viewpoint it was a pronounced failure.

The outstanding feature of the fair was the marked improvement both in the design and the construction of German machinery products. A return to pre-war standards of efficiency as regards quality of material and workmanship was plainly noticeable and the determination of the German machine industry to regain the lost foreign markets by sheer "quality first" products is strikingly illustrated by the fact that the various substitute metals and materials are fast disappearing. Wherever such substitute materials have proved their serviceableness beyond doubt, they are retained with a view of cheapening production.

As at the last technical fair in the spring of 1920, the collective exhibition of the Association of German Machine Tool Manufacturers formed again the center of attraction, showing a great variety of fine specimens of modern machine tools and revealing many interesting departures in the design of German machine tools. The latter feature was particularly noticeable in grinding-machine construction, there being a distinct tendency to devote increased attention to the design where the operation is finished by the entire width of the wheel without longitudinal shifting of either the piece or the wheel.

Another striking feature of the fair was the progress made in the construction of automatics and semi-automatics as evidenced by the exhibited specimen and it was interesting to note that many types were clever copies of the Gridley. There were also a great variety of exhibits of planers and drilling machines, many of which showed the influence of American trend of design.

It would certainly take up too much space to enumerate all the branches of industry represented; suffice it to say that the fair afforded a splendid opportunity to become acquainted with the standard lines of German machine manufacturers as well as to gain an idea of the novelties and improvements introduced during the year.

There were approximately 3,400 exhibitors at the Fair which was visited by about 34,000 people. As was remarked at the beginning, very few deals were closed, customers adopting a rather reserved attitude on account of high prices, and a tendency to hold back with orders in anticipation of a break of prices in the near future was noticeable.

That this anticipation is not entirely unjustified is clearly shown by the report made by one of the leading personalities in German industrial life, Director Becker, of Cologne, at the annual meeting of the Association of German Machine Manufacturers held at Berlin in the middle of September. In the course of his statement on the economic situation of the German machine industry he emphasized the difficulties with which the industry was confronted in executing the many and large foreign orders placed a year ago. While the cost of labor, raw material, overhead charges, etc., was rapidly advancing, the depreciation of the mark increased to an alarming extent, resulting in serious losses to the industry in general though many works succeeded in weathering the storm by reaching an understanding with their foreign customers. Something like a catastrophe set in when the mark improved and thereby automatically raised the price of German machinery above the world's market level. In spite of a reduction of prices, the German industry was unable to carry that reduction so far as to be able to compete effectively with the industries of foreign machinery-producing countries, with the result that a falling off of orders and cancellations were steadily increasing.

As regards export possibilities, Director Becker stated that outlook was anything but favorable, seeing that most of the former neutral countries were on the whole well supplied with machinery products, while Eastern and Southeastern Europe did not enter into consideration at all. Italy, France and Belgium were fully able to supply their own industries themselves while such goods as had to be imported were chiefly ordered in Great Britain or the United States. According to his opinion, the latter two countries had lost their importance as a purchasing factor for the German machinery export industry; moreover, they had now become formidable competitors in the world's markets where their influence—chiefly by reason of financial interests—is being increasingly felt. Continuing, the speaker dwelt upon the far-reaching results of the business stagnation in Germany.

Inland sales being practically nil, many works had to reduce working hours or shut down altogether for an indefinite period and the unemployment would have been even more pronounced but for the fact that many works are still busy on orders contracted last year, or are manufacturing stock. The latter policy, however, could not be carried on indefinitely seeing that there are large stocks of machinery valued at several million marks without there being any reasonable hope of a speedy clearing. The principal reason for the lagging of inland sales, he declared, was to be seen in the enormous extension of machinery-using plants during the war. Orders being few and far between now, many of those plants were selling their entire equipment to foreign firms, thus aggravating the difficulty of the export industry. Director Becker foreshadowed that legislative measures will be taken with a view of putting a stop to that practice. In conclusion he pointed out that a reasonable reduction of prices should be effected quickly and emphasized the fact that no improvement of the general situation could be hoped for unless the machine industry determined upon a reconstruction of its program by devoting all energies to standardization and specialization of manufacture, while a recovery of the foreign markets will be intimately connected with a further reduction of the cost for raw materials, abolishing the export duty, setting a limit to further wage claims and improving the lowered capacity and efficiency of the works.

LD'S INDUSTRIAL FORGE
News Editor

Machine Builders Meeting Changed from November to December

We have just received word that the annual meeting of the National Machine Tool Builders' Association will be held at the Hotel Astor in New York City on Nov. 11 and 12 instead of on Dec. 4 and 5, as previously announced.

Money and Markets

CREDIT SITUATION

The downward revision of prices continues to be the factor dominating the general business outlook. The movement is a natural and inevitable corrective of the unstable condition created in the previous period of rising prices, reckless public buying and widespread speculation. Falling prices are not a recent development. Before the close of 1919 the prices of a number of important commodities had begun to decline. By spring of 1920 a definite downward trend had been established. Since then the movement has been accelerated, until within recent weeks it has forced general recognition that the period of excessive buying at rising prices has definitely ended. Business must now go forward on a lower price level. This readjustment cannot be affected without embarrassment in individual cases. It will be effected, however, without serious general results by reason of the inherent strength of the credit situation and the assured co-operation of the banks with business.

The banks are amply prepared to finance business while it is working out a more normal basis of operation and a stable level of prices. This process will require the employment of a large volume of credit. Inventories cannot be disposed of abruptly. In many lines, owing to general indisposition to buy, their liquidation must be effected very gradually.

Stabilization on a new price basis does not involve a return to the pre-war price level. For nearly two decades prior to the war, prices have been rising steadily. On economic grounds this rise might reasonably have been expected to continue, had there been no war. Moreover, the improvement effected in our credit and banking machinery since the inauguration of the Federal reserve system now enables a given gold reserve to finance a greater volume of business at higher prices than was practicable in the pre-war days. The country's present gold reserve greatly exceeds the pre-war reserves, and will have a sustaining influence on the new price level.—*National Bank of Commerce.*

Judge Gary, Before Iron and Steel Institute, Says Price Reductions Are a Healthy Sign

Believes Former Levels Were Outrageously High — Declares That Business Skies Are Without Clouds and That U. S. Steel Men Should Co-operate With Other Nations

"Recent decreases in the volume of new business and voluntary reductions in selling prices in some departments of the iron and steel industries reflect a decidedly healthful condition," Elbert H. Gary, president of the American Iron and Steel Institute, and chairman of the United States Steel Corporation's directorate, said on Oct. 22 at the semi-annual meeting of the institute in the Hotel Commodore, New York.

Additional F. A. E. S. Members

KANSAS ENGINEERING SOCIETY. The Kansas Engineering Society, by letter ballot, has voted to become a charter member of the Federated American Engineering Societies and has named Lloyd B. Smith as the delegate to represent the society at the first meeting of the American Engineering Council on Nov. 18-19, 1920.

ALABAMA TECHNICAL COUNCIL. The Alabama Technical Council at its regular meeting on Oct. 1, 1920, voted to become a charter member of the F. A. E. S.

Judge Gary counseled that the manufacturers be "reasonable and just," reducing prices "if and when other reductions and costs permit, and then with level heads and honest convictions stand solidly as against panic and lack of confidence in the industrial situation."

"The people have cause for confidence in the business future," Judge Gary emphasized. He analyzed the philosophy behind the post-war price movement by suggesting that as there was a scramble for higher and still higher prices there will be its equivalent in selfishness in the enforced reduction.

Judge Gary said that in his recent tour of Europe he found the steel mills of Belgium and France working day and night. He said France and Belgium need and deserve financial and commercial assistance from the people of the United States, and, he added, this will be accorded. His opinions on the business outlook were as follows:

"Although this is a time for courage, composure and caution, the business skies are practically without clouds. It is up to the business men and women to maintain certain and continuous business activity in satisfactory volume with fair and reasonable profits.

"In certain lines of the iron and steel industry there have of late been some decreases in the volume of new business and also voluntary reductions in selling prices. I consider this decidedly healthful. All, or nearly all, of us have for months been unable to supply the demands of our customers as to quantities or deliveries and our prices, considered as a whole, have resulted in profits. As a matter of course some adjustments will need to be made. The average of the general scale ought to be reduced equitably and relatively. Without referring to individual cases or lines of general business, I believe in many instances prices have been outrageously high. This observation applies more especially to middlemen, so called, and to smaller departments of industry.

"Now a general public, including particularly those who are neither sellers nor buyers to a large extent, will in one way or another bring about a fair and reasonable adjustment of prices. The law of supply and demand will be the principal factor.

"Let us be reasonable and just, reducing our prices if and when other reductions and costs permit, and then with level heads, clear minds and honest convictions, stand solid as against panic or lack of confidence in the industrial situation. Let us strive to be right. If we are right we can be determined and courageous. Let us as individuals consider the interests of all others.

"The people of the United States have reason for confidence in the business future. They need not be discouraged nor impatient. Love of country is the rule. Indeed, it is the habit.

"I think the members of the Iron and Steel Industry of the United States, up to the full limit of propriety, should co-operate with those of other countries.

"The onward march of progress is moving rapidly. We may and will be a part in the procession and, in a measure, assist in guiding the course. I have heretofore publicly said, quoting

from the Bible: 'As no man liveth to himself so no nation liveth to itself.' This is applicable to the present period."

At the banquet in the evening an address by H. Cole Estep was read by John A. Penton on the European iron and steel industry. He said that with the American dollar holding the same relative position in the world's moneys American iron and steel prices were higher than those of any country, but with the exchange rates of the different countries favoring the United States American iron and steel prices were the lowest. He stated that Great Britain is the only country that the United States has to fear in the export trade during the next two years, and that England is the only country in Europe today producing more iron and steel than prior to the war. In speaking of the future possibilities of American exports, Mr. Estep said that America's best chance was to export billets and plates to Great Britain and that there would develop a large increase in our export trade as Europe became able to invest in larger and larger enterprises.

George Otis Smith, director of the United States Geological Survey, said that while the unmined resources of the United States were billions of tons, that at the present rate of consumption there was need of conservation. He indorsed Hoover's recent statement that the bituminous coal industry was the worst functioning industry in existence.

During the morning session, C. P. Perin, a consulting engineer of New York, addressed the institute on the "Industry and developments in the iron and steel industry in India"; A. H. Holliday, manager of exports, Jones & Laughlin Steel Co., Pittsburgh, Pa., spoke on "Foreign Trade," while in the afternoon F. L. Toy, superintendent open hearth department, Homestead Works of the Carnegie Steel Co., read a paper entitled "The Basic Open Hearth Process"; D. M. Buck, of the American Sheet & Tin Plate Co. had one on the "Review of the Development of Copper Steel."

Detroit Twist Drill Co. Opens Canadian Plant

The Detroit Twist Drill Co. has announced the establishment of a manufacturing plant in Walkerville, Ontario, known as the Canadian-Detroit Twist Drill Co. The Detroit company decided several months ago that the growth of Canadian industry warranted the construction of a plant across the border, and the new company was accordingly incorporated. High-speed drills and reamers will be manufactured and a complete stock will be built up as soon as possible. The nucleus of the Walkerville organization was formed from the personnel of the Detroit plant. About thirty men will be employed at the start and the company expects to expand as fast as business conditions warrant.

H. M. Houston Joins Stamets Force

The policy of the William K. Stamets machine tool organization, of Pittsburgh, Pa., is to continually enlarge and strengthen its staff of salesmen, engineers and executives. On October 1 H. M. Houston, who recently resigned from the Houston, Stanwood & Gamble Co., takes up executive duties as an active member of the William K. Stamets organization. As Mr. Houston has been in close touch with the Stamets organization for a term of years, he is with old friends and is not entirely unfamiliar with his new duties.

H. M. HOUSTON

Tentative Annual Meeting Program of the A. S. M. E.

The 1920 annual meeting of the American Society of Mechanical Engineers will be held in the Engineering Societies Building, 29 West 39th St., New York, on Dec. 7 to 10, 1920.

Special attention is called to the Keynote Session to be devoted to the subject of Transportation. Invitations have been issued to authorities in the sub-divisions of Railroads, Waterways, Terminals and Motor Trucks, and an especially strong speaker has been requested to present the broad phases of the entire problem.

Keynote Session on Transportation

The following phases of the Transportation Problem will be discussed by authorities in this field:

Railroads, Feeders, Waterways, Motor Trucks, Terminal Problems in New York City.

Sessions of Professional Sections

Fuels:
Fuel Supply of World—L. P. Breckenridge.
Low Temperature Distillation of Coal—O. P. Hood.
Fuel Conservation versus Money Conservation—D. M. Myers.
Form Value of Energy in Relation to Its Production, Transportation and Application—Chester G. Gilbert, Jos. E. Pogue.

Machine Shop:
Side Cutting of Thread Milling Hobs—Earl Buckingham.

Management:
The Life and Work of the late Henry L. Gantt.
Mr. Gantt's Contribution to Industry—Fred J. Miller, Pres. A. S. M. E.
Mr. Gantt's Contribution to Shipbuilding, Ship Operation, Ordnance and Aircraft—Marshall Evans.
The Culmination of Mr. Gantt's Work—E. A. Lucey.
An Appreciation from France—M. Ch. de Freminville.
An Appreciation from Great Britain—James J. Butterworth.
Mr. Gantt's Industrial Philosophy—W. N. Polakov.

Railroad:
Static Adjustment of Trucks on Curves—R. Eksergian.
Increasing Capacity of Old Locomotives—C. B. Smith.
Modernizing Locomotive Terminals—Geo. W. Rink.

Textile:
Humidity Control in Textile Plants—Author to be announced.
Power Application to Finishing Plants—Leo Loeb.
Textile Fabrication for Mechanical Purposes—J. W. Cox.
Ventilation of Dye Houses—D. W. Andrews.

Power:
Session devoted to Consideration of Future Development of Power.

Special Sessions

Woodworking:
Engineering in Furniture Manufacture—B. A. Parks.
Use of Wood for Freight Cars—H. S. Sackett.
Woodworking Education—F. F. Moon.
Wooden Hollow Ware—John L. Graham.
Wooden Factory Flooring—L. T. Erickson.
Wood Preservation—E. S. Park, J. M. Webber.
Electrically Operated Saw Mills—A. E. Hall.

Research:
Calibration of Nozzles for the Measurements of Air Flowing into a Vacuum—Wm. L. de Baufre.
The Heat Insulating Properties of Cork and Lith Board—A. A. Potter, J. P. Calderwood, A. S. Mack, L. S. Hobbs.
The Flow of Fluids through Pipe Lines and the Effect of Pipe Line Fittings—D. E. Foster.
Steam Formulae—R. C. H. Heck.

Design:
Disastrous Experiences with Large Center-Crank Shafts—Louis Illmer.
Tests of Truck Rear Axle Worm Drive—K. Heindlhofer.
Foundations for Machinery—N. W. Akimoff.

Miscellaneous:
The Constitution and Properties of Boiler Tubes—A. E. White.
Armor Plate and Gun Forging Plant of the U. S. Navy Department at Charleston, W. Va.—Roger W. Freeman.

Railway Association Convention Held Oct. 12 to 14

The American Electric Railway Association held its thirty-ninth annual convention at Atlantic City, N. J., on Oct. 12 to 14. President John Purdee called the meeting to order in the Greek Temple, the title of his address being "Industry on the Road to Better Days." Business of the association followed.

During the three days of the convention many papers were read along lines relating to electric railways. "The Settlement of Labor Disputes," was the title of an address by Governor Henry J. Allen of Kansas. This was a feature of the program. The evening entertainments consisted of the annual reception Monday night, informal dancing Tuesday night, the "Country Fair" Wednesday night and the annual ball on Thursday night.

The selection of Philip H. Gadsden for president for the ensuing year seems a wise choice, as his part in the work of the Federal Electric Railway Commission has given him a vision of the industry as a whole.

Changes in Personnel of Machine-Tool Combine

Charles E. Hildreth, general manager of the National Machine Tool Builders' Association, has resigned as president of the Whitcomb-Blaisdell Machine Tool Co.

Albert E. Newton, president of the National Metal Trades Association and of the National Machine Tool Builders' Association, has resigned as vice president and general manager of the Reed-Prentice Co. Mr. Newton felt that his financial interests other than those connected with the Reed Prentice Co. require his entire time, and his resignation to take effect Jan. 1, 1921, was tendered some time ago. Until 1922, however, he will remain with the Reed-Prentice Co. in an advisory and consulting capacity.

F. O. Hoagland, recently vice president and general manager of the Bilton Machine Tool Co., Bridgeport, Conn., has been made general manager of the Whitcomb-Blaisdell Co. and the Becker Milling Machine Co. and is expected to be elected general manager of the Reed-Prentice Co. soon. The three companies mentioned are to a great extent owned by the same interests and their management is being consolidated to secure greater efficiency. A central executive office was established early in the year at 53 Franklin St., Boston.

Annual Meeting of A. M. E. A.

(*Continued from last week.*)

At the banquet of the American Manufacturers' Export Association meet held at the Waldorf-Astoria, New York, on Oct. 14, speeches were made by Dr. Charles A. Eaton, of *Leslie's Weekly*, on "The Human Side of Industry"; by Alba B. Johnson, of the Philadelphia Chamber of Commerce, on "Transportation and the Citizen's Responsibility"; and by Alfred Reeves, manager of the National Automobile Chamber of Commerce, on "How America is Motorizing the World."

Dr. L. S. Rowe, director-general of the Pan-American Union, spoke of Latin-American markets. An abstract of his address follows.

While the experience of the last five years has served to impress upon us the importance of Latin America as a market for our manufactured products, it has failed to bring about anything like a corresponding change in the fundamental attitude of the American business community toward these countries. Although willing to fill such orders as may be sent, and, in fact, ready to indulge in a somewhat feverish and spasmodic attempt to secure such orders, we are apparently not prepared to take the steps necessary to secure a permanent foot-hold in these countries. That permanent foot-hold is to be secured through the investment of American capital. In order to attain this end, however, we must bring about a change in the point of view of the American investor; a strengthening of his confidence in the stability and security of investments in Latin American countries. Unfortunately, a few isolated instances of losses sustained by American capitalists have created an entirely false impression as to the security of foreign investment in Latin American countries. The large losses in Mexico during the last ten years have served to color our vision with reference to all of Central and South America. As a matter of fact, the number of losses to foreign capital in Central and South America during the last 25 years, due either to violence or unfair treatment, has been so small as to be almost negligible. As regards taxation, the burden on foreign investments in South America is far less than on similar investments in the United States. While large returns are justified, it is unfair to say that such large returns must be assured because of the extraordinary risks involved. As a matter of fact, risks in most sections of Latin America are no larger than in the United States. The fact remains, however, that the spirit of confidence of the American investor must be strengthened if we are to become permanent factors of importance in Latin American markets.

U. S. Chamber of Commerce on Business Conditions

Somebody has got to pay the piper in the present decline of prices, according to Archer Wall Douglas, chairman of the committee on statistics and standards of the Chamber of Commerce of the United States, in his monthly report on general business conditions.

Pointing out that natural laws are no respecter of persons, Mr. Douglas says that no price understandings, nor withholding of products from the markets ever succeed for more than a comparatively brief space of time in maintaining the price of any commodity.

"Those who predicted continued high prices because of the great volume of money have mostly taken to the woods," he says. "For the amount of currency in circulation today is greater than ever before, and yet prices are on the downward movement.

"Declines in food prices are naturally following the abundant harvest. Corn is selling at about half the high prices of twelve months ago. Nor has much labored propaganda about the great demand for breadstuffs to be expected from Europe sufficed to maintain the price of wheat. Another reason is that our neighbor, Canada, has a great crop. The three prairie provinces alone will produce about two hundred and fifty million bushels of wheat. They can consume only a small portion of it, and their storage facilities are most inadequate. There is nothing left for them but the export trade.

"Unemployment grows slowly. It is most noticeable in industrial life and in localities connected with textiles, leather goods and automobiles. Coincidentally the strike fever is waning, and efficiency is increasing, for there is a fast growing public demand for service, a demand born largely of what we have endured on every hand for the past five years. We are fast coming to the period when the standards will be those of common sense and work honestly done. We shall, in all likelihood not experience any shortage of labor during the coming months.

"The corn crop is made. The mere story of its unprecedented volume brought about the present low prices, especially of the December option. And thereby hangs a tale. Nothing has sufficed to keep up the prices of wheat and cotton. For the laws of supply and demand cannot eventually be denied. Every student of the situation realizes that much of the welfare of the country depends upon the purchasing power of the farmer. And that this in turn hangs upon his receiving reasonably remunerative prices for his products. But how to do this in face of the competition, nation-wide, is yet an unsolved problem.

"Few stories are of greater moment and importance to the nation than that of the recently published history of lumber; of the priceless heritage of the vast forests which once covered so large an area of this country. They are more than half gone, and still we are deaf, dumb and blind to the grim consequences of this fatal lack of foresight. The vital needs of forests and trees in every phase of country life needs no setting forth. In industrial life the need is equally as pressing despite all the substitutes for wood we are daily concocting. Besides there are vast industries whose very existence depends upon the continued production and use of wood. Lumber and things made of wood must daily grow more expensive and difficult to obtain. Yet we have scarcely learned the first elements of reforesting—as it is done, for example in France. Meanwhile a great business, that of lumber, is employed in consuming its capital. And between this and the areas of feasts and famines of demand and prices which mark its history it is wondering what fate has in store for it."

Nashville Corporation Buys "Old Hickory" Powder Plant

The War Department has announced that the Nashville Industrial Corporation has been the successful bidder for the plant and equipment of the "Old Hickory" powder works, located outside the city of Nashville, Tenn.

The plant was built by the government during the late war at an approximate cost of $80,000,000. It has been sold to the Nashville Corporation for $9,000,000.

Cambria Steel Production Decreases

Production at the Cambria Steel Co.'s plant, Johnstown, Pa., has decreased due to failure to obtain materials and the need of repairs, says Vice President L. R. Custer issuing the following bulletin: "Production will be curtailed in the Bessemer works and also in both the Cambria and Franklin open-hearth plants. Only seven of the eleven furnaces are going. This curtailment is due to falling off in orders, as to all except three furnaces. Three are being reconstructed and repaired."

The A. S. M. E. Committee on Plain Limit Gages for General Engineering Work held a meeting on Oct. 14 and 15 at Cleveland. Reports were made and past work was discussed. Subcommittees were selected to obtain data for the establishment of the various classes of fit necessary in interchangeable manufacture; these will make reports at a later meeting.

Westinghouse Co. Enters Wireless Field

The Westinghouse Electric and Manufacturing Co. has announced that it is prepared to enter the wireless field on a large scale. In furtherance of this the company has taken over the International Radio Telegraph Co. and will apply to the manufacture of wireless equipment the benefit of the research and development work undertaken for the Government during the war.

The International Radio Telegraph Co. maintains wireless stations on ships and has shore stations at Newport, New London, Brooklyn and Cape May, as well as others under construction in Maine and Massachusetts. It is stated that the company is perfecting a worldwide service of overseas wireless telegraph communication, as well as being active in the development of wireless telephony. R. A. Fessenden, one of the pioneer investigators in the continuous wave field, founded the company, which controls his patents.

In a statement issued by the Westinghouse Co., it was asserted that the older International Radio Telegraph Co. has been reorganized to form a new company of the same name. This company will have a capital of $1,250,000 in preferred stock and 250,000 shares of common stock of no par value. Guy E. Tripp, chairman of the board of the Westinghouse Co., is chairman of the new International Radio Co. The other officers are E. M. Herr, president; S. M. Kintner, Calvert Townley and H. P. Davis, vice presidents, and J. V. L. Hogan, manager. With the exception of Messrs. Kintner and Hogan, president and manager, respectively, of the older company, all of the officers are Westinghouse officials.

In connection with the new undertaking the Westinghouse Co. has equipped a special factory at East Springfield, Mass., for the manufacture of wireless apparatus. It will not only furnish outfits for the new International Radio Telegraph Co., but will devote its energies as well to supplying the needs of watercraft, railroads, power companies, factories, mills, mines, camps and ranches.

The engineers of the company have directed special attention to the problem of reducing interfering electric disturbances, with the result, it is asserted, that the Westinghouse system is on a par with the best wire and cable telegraphy as regards reliability.

War Veterans Favor M. E. Courses

Of the 1,949 disabled ex-service men who are taking vocational education courses, 447 are pursuing studies in mechanical engineering. This instruction is being given under the auspices of the Federal Board for Vocational Education, at ninety-six schools, of which thirteen are in New England, twenty-seven in the East, eight in the South, thirty-five in the Middle West, and thirteen in the West.

A. C. & F. Co. Spending $3,500,000 in Improvements—Changes in Personnel

Announcement was made by the New York office of the American Car and Foundry Co. that as a part of its plan of extension in the Buffalo district, W. H. Sanford, for many years district manager of its Buffalo plants, had been appointed assistant vice-president and would be placed in charge of sales in this vicinity.

Prior to the formation of the American Car and Foundry Co., Mr. Sanford was employed by the Union Car Co., and when that company was absorbed he was appointed paymaster and cashier at the Depew plant. In 1902 he was appointed local auditor of the Buffalo district followed by promotion to the position of resident representative. Later, in 1912, he was made district manager in charge of the Depew as well as the Buffalo Plants.

Mr. Sanford will be succeeded as district manager by Andrew H. Gairns now occupying a similar position with the company in Chicago. Mr. Gairns will direct the operation of the new plant in Buffalo, the foundries located here, and the plant at Depew. He has had an extended experience in steel car work and locomotive building and is well qualified to take up the duties demanded by the Buffalo district.

Announcement was made at the same time that the company's new plant now under construction in this city will be used for building all-steel cars, with a capacity for turning out 20 to 30 cars per day. It will be equipped with the most modern machinery and labor-saving devices. There will be a number of features introduced which are entirely new and novel to the car-building industry. In addition to the new car-building plant a modern up-to-date office building will be erected on property recently acquired across Babcock St. The soft foundry at the Buffalo plant has been completely re-equipped and is now engaged in quantity production. The Niagara wheel department has also been brought up to a high state of efficiency.

At Depew, during the war, the company was the largest producer of 155-mm. shell. Immediately following the armistice, the entire Depew plant was reconstructed and is now capable of building twenty cars per day. E. G. Englehart is assistant district manager at Depew.

The car company's plans thus briefly outlined above involve a total expenditure of $3,500,000.

A site for the new building in Washington which is to serve as a home for the National Academy of Sciences and the National Research Council has recently been obtained. It comprises the entire block facing the Lincoln Memorial in Potomac Park. The Academy and Council have been enabled to secure this admirable site, costing about $200,000, through the generosity of friends and supporters.

Obituary

TOM HARTLEY, fifty years old, proprietor of the Hartley Machine Works at the Bush Terminal, and widely known as a maker of printing presses, died on Oct. 13 of heart trouble. Mr. Hartley was born in Burnley, Lancashire, England, and was a civil engineer by profession. He was, in his early business career, engineer for a sugar plantation in the British West Indies. His father, the late James Hartley, was a ship builder.

JAMES CLARENCE HARBOURT, of the Westinghouse Air Brake Co., died on Oct. 9, 1920.

JOHN L. JACOBS, for over thirty years with the Brown & Sharpe Manufacturing Co., Providence, R. I., died in New Haven, Conn., Oct. 3, at the age of seventy.

M. B. JOHNSON, chairman of the board of the White Motor Co., died recently in Cleveland.

LOUIS A. COOK, office manager of the Wells Brothers Co. branch of the Greenfield Tap and Die Corporation, of Greenfield, Mass., died Oct. 17 at his home in Greenfield. Mr. Cook was sixty-one years old.

ALVIN A. WINSHIP, superintendent of machinery at the plant of the Bethlehem Shipbuilding Corporation, Sparrows Point, Md., died Oct. 17 from a tumor of the brain. He was 48 years old and had been associated with the Sparrows Point plant since July, 1916.

Personals

S. N. PETERSON, purchasing agent of the S.K.F. Ball Bearing Co., Hartford, Conn., has been appointed purchasing supervisor of the S.K.F. Industries, Inc., with headquarters at New York.

R. G. BARRINGTON, for fifteen years with the Cleveland Twist Drill Co., is now Cleveland sales manager for the Reed-Prentice Co., Becker Milling Machine Co. and Whitcomb-Blaisdell Machine Tool Co. combine.

GEORGE S. BARTON, president and treasurer of the Rice, Barton & Fales Machine and Iron Co., Worcester, Mass., machinery manufacturers, has been elected a director of the Massachusetts Chamber of Commerce.

G. J. KELLER, formerly district manager of the Buffalo office of the Knox-Anderson Tool Co., has resigned and accepted a position as sales manager for the Frontier Chuck and Tool Co., Buffalo, N. Y.

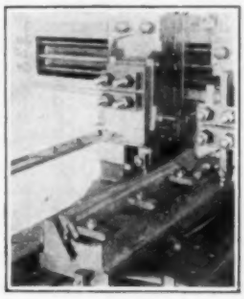
JOHN F. STANTON, eastern sales agent of the Crucible Steel Co., 2 Rector St., New York, has resigned his position and is now associated with the John Illingworth Steel Co., of Frankford, Phila., Pa., and 217 Broadway, New York, as general sales manager.

Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

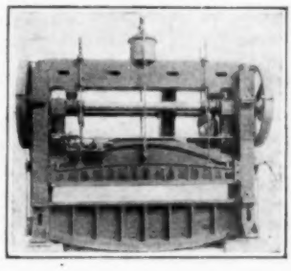
Planing Tool, Oil-Groove
Hanson-Whitney Machine Co., Hartford, Conn.
"American Machinist," Sept. 30, 1920

This device is intended for cutting zig-zag oil grooves in slides. It is mounted on the clapper of the planer, and means are provided for locking the clapper. The device itself has a small clapper box carrying the grooving tool and mounted on a cross-slide, its position being adjustable. A bar cam is fitted in the body of the device, one end being attached to an upright strapped to the planer table, so that it moves with the work. The connection is made through both horizontal and vertical slides, so that considerable freedom of movement of the planer head carrying the device is possible. As the planer table travels, the follower in the cam groove is caused to reciprocate, its motion being transmitted to the grooving tool.



Press, Tie-Rod, 500-Ton
Williams, White & Co., Moline, Ill.
"American Machinist," Sept. 30, 1920

This machine is designed for blanking outside rails for pleasure cars. All gears and operating parts are located overhead so that the work can be placed in and removed from the front, back or either end of the machine. Specifications: Capacity, 500 tons. Distance between housings, 16 ft. Width: table, 30 in.; ram face, 30 in. Die space: Maximum, 23 in.; minimum, 11 in. Stroke, 7 in. Openings in housings, 24 in. Height, 21 ft. Length, 21 ft. 10 in. Width, 10 ft. 6 in. Stroke per min., 12. Motor, 75 hp.

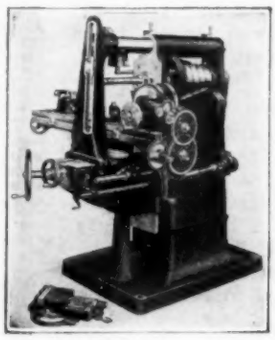


Milling Machine, Continuous
Newton Machine Tool Works, Inc., 23rd and Vine Sts., Philadelphia, Pa.
"American Machinist," Sept. 30, 1920

The column and base of this machine are cast in one piece, in order to eliminate a bolted joint between them. The table is circular in form and adjustable upon the base, in order to provide for the proper positioning of the fixtures. Tables can be furnished either 24, 36 or 48 in. in diameter. A fixed feed controls the rotative movement of the table. The left-hand spindle is used for the roughing operation, and the right-hand spindle for finishing. The distance between the centers of the spindles varies from 13 to 22½ in., depending upon the size of the table used, so that long pieces can be completely machined in the roughing operation before the finishing cutter starts on them. The machine is driven through worm gearing by an individual motor. The head carrying the spindles is adjustable.

Milling Machine, Universal Back-Geared, "No. 1½"
American Milling Machine Co., Cincinnati, Ohio.
"American Machinist," Oct. 7, 1920

Specifications: Same general dimensions as for the plain milling machine. Universal table swivels 54 deg. on each side of center; 11-in. universal dividing head. Net weight, 3,400 lb. Weight crated, 3,650 lb. Weight boxed for export, 4,100 lb. Export case, 118 cu.ft. When desired, a swiveling vertical milling attachment can be furnished, which is secured to the face of the column by four screws and located by the front spindle bearing; it can be set at any angle. The columns of all machines are drilled and tapped for this attachment, the distance from the face of the column to the center of its spindle being 10 in.

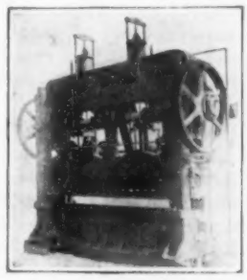


Grinding Machine, Wet Tool, Oilstone
Mummert-Dixon Co., Harrison, N. J.
"American Machinist," Sept. 30, 1920

This machine is intended for general tool grinding in both toolrooms and machine shops, and is provided with three wheels of different grades. It is thus possible to rough and finish a tool on the same machine. The machine can be driven either by motor or by belt, a countershaft being furnished in the latter case. Specifications: Size of wheels; coarse, 16 x 2 in.; medium and fine, 10 x 2½ in. Speed; coarse wheel and pulley, 1,350 r.p.m.; medium and fine wheels, 675 r.p.m.; countershaft, 450 r.p.m. Driving pulley, 6 x 4½ in. Countershaft; length, 24 in.; drop, 12 in. Motor, 3 hp., 1,800 r.p.m. Floor space, 33 x 41 in. Net weight, 1,075 lb.; with countershaft, 1,285 lb.

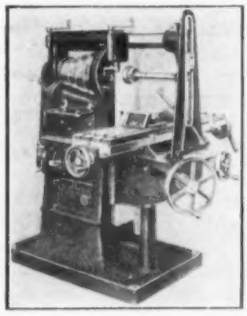
Press, Tie-Rod, 800-Ton
Williams, White & Co., Moline, Ill.
"American Machinist," Sept. 30, 1920

This machine is designed for blanking outside rails for motor trucks. All operating parts are located overhead. The strippers are operated by cams on the crankshaft. The table and ram have T-slots. The crankshaft is driven from both ends, and an automatic knockout is connected and operated by the ram. Specifications: Capacity, 800 tons. Distance bet. housings, 18 ft. Width: table 30 in.; ram face, 30 in. Die space: Maximum, 23 in.; minimum, 11 in. Stroke, 7 in. Openings in housings, 24 in. Height, 24 ft. 7 in. Length, 24 ft. 9 in. Width, 13 ft. 2 in. Strokes per min., 8. Motor, 100 hp.



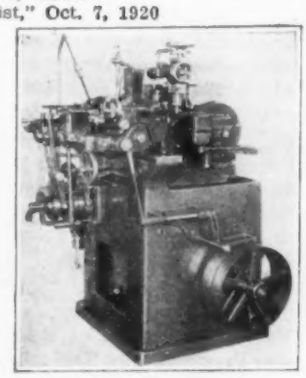
Milling Machine, Plain Back-Geared, "No. 1½"
American Milling Machine Co., Cincinnati, Ohio.
"American Machinist," Oct. 7, 1920

Specifications: Working surface of table, 46 x 10½ in. Power longitudinal feed, 25 in. Power cross feed, 9 in. Hand vertical feed, 19 in. Face of column to overarm brace, 21⅜ in. Size of taper hole in spindle, No. 10 B. & S. Spindle speeds, 16, ranging from 12 to 382 r.p.m. Distance from overarm to center of arbor, 6½ in. Four-step cone pulley with largest diameter 11 in. and smallest diameter, 7⅝ in. Width of belt, 3 in. Sixteen feeds ranging from 0.005 to 0.212 in. Two-speed countershaft, 107 and 265 r.p.m. Countershaft friction pulleys, 12 x 4 in. Floor space, 85 by 64 in. Net weight, 3,000 lb. Weight crated, 3,250 lb. Weight boxed for export, 3,700 lb. Export case, 118 cu.ft.



Grinding Machine, Full-Automatic
Warren G. Fraser Co., Westboro, Mass.
"American Machinist," Oct. 7, 1920

The machine is intended for grinding rolls and other small work where the length of the surface to be ground does not exceed the width of the grinding wheel. The work is placed in a magazine and fed by gravity to the machine. The automatic control unit consists of a cam-set rotated by worm gearing, and all operations are entirely automatic. Both the wheelhead and headstock rest on three-point bearings. The wheel-spindle is hardened and ground and runs in bronze boxes which are adjustable for wear. The wheel-slide is adjusted by a screw having a graduated hand-wheel.



Clip, paste on 3 x 5-in. cards and file as desired

PAUL E. THOMAS, president of the Kempsmith Manufacturing Co., Milwaukee, Wis., returned on Oct. 23 from an extended business trip through Europe.

F. W. RUGGLES, formerly manager of the Republic Motor Car Co., Alma, Michigan, has been appointed president and general manager of the Ruggles Motor Truck Co., which has just been incorporated for $3,000,000, with head offices at London, Canada.

PAUL MOORE of the Service Motor Truck Co., Wabash, Indiana, has been appointed general manager of the firm's Canadian branch which will be located at London, Ont.

HOWARD C. HOEFLICH has resigned his position as secretary of the Case Crane and Engineering Co., of Columbus, to accept a position as general purchasing agent for the F. G. Austin Machinery Corporation, of Chicago.

A. Z. POLHAMUS has been elected president and general manager of the Visible Pump Co., of Fort Wayne, Ind., manufacturer of gasoline and oil pumps and distributing systems. Mr. Polhamus was formerly general manager of the S. F. Bowser Co., Inc., of Fort Wayne, Ind., for twenty-five years.

EDWARD CASEY has joined the Duff Manufacturing Co. as the sales representative of the forge department in the East, with offices at 50 Church St., New York. Mr. Casey was formerly associated with Kraenter & Co. and the Bethlehem Steel Co.

S. S. SMITH has joined the sales organization of the Jones & Lamson Machine Co., Springfield, Vt. Mr. Smith was formerly with the Windsor Machine Co., now the National Acme Co., of Windsor, Vt. During the war he was a superintendent at the plant of the John-Thomson Press Co., at Long Island City, N. Y., and was also with the General Vehicle Co., of the same place, for a time.

ALEX CROWE, formerly superintendent of the Western Gas Construction Co., Ft. Wayne, Ind., has accepted a position as superintendent of the Aetna Foundry and Machine Co. of Warren, Ohio. Mr. Crowe was formerly with the Youngstown Sheet and Tube Co.

W. W. IRWIN, for many years president of the Canton Sheet Steel Co., has left this concern to head the newly organized Superior Sheet Steel Co., which began operation one month ago at its new plant at Louisville, Ohio.

WILTON BENTLEY, works manager of the Mercury Manufacturing Co., a Chicago trailer and truck manufacturing concern, for the past three years, has resigned in order to accept the managership of the New York office of the K. W. Battery Co., of Chicago, Ill.

F. RODGER IMHOFF, who has been located in Detroit as field engineer for the Precision and Thread Grinder Manufacturing Co., Philadelphia, Pa., has been appointed sales manager of that company.

Business Items

The superintendent of the Virginia Mechanic's Institute, Richmond, would like to get in touch with manufacturers who would be willing to supply the institute with rough castings to be machined by the students.

The new plant of the Kelly Reamer Co., located at 3705 W. 73rd St., Cleveland, Ohio, was officially opened on Oct. 9. This addition to the factory has been completely equipped with the latest improved machinery for producing high-grade tools.

The combine of Reed-Prentice Co. and the Whitcomb-Blaisdell Machine Co., Worcester, Mass., and the Becker Milling Machine Co., Boston. Mass., has announced the opening of permanent offices in the Liberty Building, Room 514, in Philadelphia.

The Dale Machinery Co., 56 Lafayette St., New York, has opened a branch office in Philadelphia in charge of E. K. Wood.

The Yale & Towne Manufacturing Co., Stamford, Conn., announces the removal of its general offices from New York City to the plant in Stamford, Conn., where a new office building has been erected.

The E. J. Manville Machine Co., Waterbury, Conn., manufacturers of sheet-metal and wire-working machinery, is completing a two-story brick and mill manufacturing addition to its plant on East Main St., which when completed will add approximately 20,000 sq.ft. of factory floor space.

The Mutual Motors Co. has recently announced that it has changed its address from Jackson, Mich., to North Tonawanda, N. Y.

Joseph Beal & Co., of 21-23 Purchase St., Boston, Mass., dealer in new and second-hand machinery and tools, announces the establishment of a branch warehouse in Water St., in Springfield, Mass., where the firm will carry a complete stock of both new and used tools and machinery.

Announcement is made of the change in name of the Signalite Manufacturing Co. to Jones, MacNeal and Camp. The company's plant is at Chicago, Ill. The management, organization and finances of the new company is in all respects identical with the old concern.

The Jewell Belting Co., Elmwood, Hartford, Conn., is planning to increase its capital stock from $500,000 to $1,000,000 for increased production. The company manufactures a high-grade factory leather belting, and recently erected a new plant in the Elmwood section of Hartford, having disposed of its old plant in the downtown section.

The Bearings Co. of America, Lancaster, Pa., has moved into its new concrete and steel factory in which all new and modern machinery had been installed. This addition to the company will increase the productive capacity about 50 per cent.

At a recent meeting of the board of directors of Landers, Frary & Clark, New Britain, Conn., it was voted to recommend to the stockholders of the concern that the capital stock of that corporation be increased one million dollars.

The Norton Co., of Worcester, Mass., manufacturer of grinding machinery, announces the opening of a branch office in Pittsburgh, with Paul R. Hawkins in charge. It will be located at 230 Fifth Ave., Room 800. As in the past the Somers, Fitler & Todd Co., of 327 Wall St., Pittsburgh, will continue to distribute the grinding wheels.

France, Belgium and Italy have issued patents to Cornelius T. Myers, consulting engineer, Rahway, N. J., covering the Myers Magazine Oiling System of Chassis Lubrication. This system is used on the Liberty Class "B," Fageol, Diamond T, Ward La France, Service, Bethlehem and several other trucks in the United States.

The Northwood Implement Co., Northwood, Iowa, has been incorporated to manufacture the Olson revolving tooth harrow, the invention of Ole A. Olson, a Northwood man. The organization is capitalized at about $100,000.

The Sanford Riley Stoker Co., Ltd., Worcester, Mass., has recently moved its general offices from 25 Foster St. to 9 Neponset St., Worcester, where all communications should be addressed.

In order to carry out an extensive industrial housing scheme and to considerably expand the size and capacity of its two plants at Attalla, Ala., the National Pipe and Foundry Co. has increased its capital stock from $100,000 to $525,000.

The New Britain Machine Co., New Britain, Conn., is planning the addition of $1,000,000 to its capital stock. This additional capital will make the outstanding capital stock three millions.

Forthcoming Meetings

The National Machine Tool Builders' Association will hold its 19th annual Fall convention at the Hotel Astor, New York City, on Thursday and Friday, Nov. 11 and 12, 1920. C. Wood Walter, care of the association's offices at Worcester, Mass., is secretary.

The National Founders Association will hold its twenty-fourth annual convention at the Hotel Astor on Nov. 17 and 18, 1920. J. M. Taylor, care of the Association, 90 West St., New York, is secretary.

The Federated American Engineering Societies will hold its first meeting at the Hotel New Willard, Washington, D. C., on Nov. 18 to 20 inclusive.

The 1920 annual meeting of the American Society of Mechanical Engineers will be held in the Engineering Societies Building, 29 West 39th Street, New York City, from Dec. 7 to Dec. 10.

The Society of Automotive Engineers will hold its annual meeting on Jan. 11 to 13 inclusive at New York.

Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

Press, Arbor, Combination

Detroit Garage Equipment Co., Detroit, Mich.

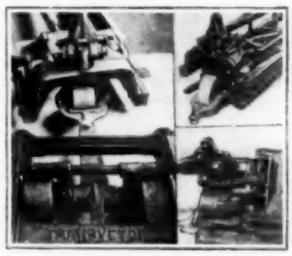
"American Machinist," Oct. 7, 1920

This combination straightening press, arbor press and truing machine is intended primarily for automobile repair work. The frame of the machine is formed from one piece of 6-in. channel steel, the cross member and vertical strut at the top being welded in place. The screw is hand operated through bevel reduction gears, is 2 in. in diameter and has a travel of 9 in. The work is supported on two ¾ x 6-in. plates. A truing device is provided for use when straightening shafts. The guaranteed capacity of the press is 50 tons, though, it is stated, 200 tons pressure can be obtained. The height of the machine is 85 in., the width 35 in., and the weight 615 pounds.

Transveyors, "Cowan" Improvements In

Cowan Truck Co., Holyoke, Mass.

"American Machinist," Oct. 7, 1920

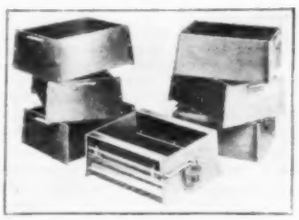


On the left is shown an attachment that enables the type "G" transveyors to be used as trailers. It requires no change in the construction of the truck, except a longer axle for the front wheel so that the coupling yoke can be mounted. The drawbar slips over the rear axle. It is stated that the two parts of the hitch are so proportioned that the shortest possible connection is provided for; that the tracking is almost perfect, and that the turning radius is so short that a train of ten trucks has been turned in a circle on a 20-ft. roadway. The two views at the right show a latch for holding up the handle of the type G truck. The latch does not interfere with the free movement of the handle, when it is necessary to bring it down to manipulate the truck.

Flask, Snap, Self-Releasing, All-Steel, with Jackets

Oliver Machinery Co., Grand Rapids, Mich.

"American Machinist," Oct. 7, 1920



The flask and jackets are of simple construction, being tapered 5 deg. so that it is easy to lift them perpendicularly from the mold. They are made of 8 to 10 gage steel and all parts are riveted together. The flask is constructed with angle irons to make it rigid and has sand supports at its parting line. These supports are connected to levers which, when depressed by the operator, withdraw them to the edge of the cope, thus enabling him to lift both cope and drag with a minimum of care. The jackets are claimed to fit exactly the molds that the flask makes.

Indicator, Dial, "Keller"

Atcheson Tool and Die Co., 609-13 North Fourth St., Columbus, Ohio.

"American Machinist," Oct. 7, 1920

The device is intended especially for gaging the diameter of cylindrical work while being rotated, as on a grinding machine. The indicator dial is mounted on the end of a shaft, through which a pin, connected with the indicator and provided with a hardened tip for touching the work, extends. The shaft is held in a split bushing, so that it can be slid either toward or away from the work. The bushing is so mounted on a link that its height can be adjusted. The base of the device can be bolted to the table of the machine on which it is used, and the indicator may then be adjusted in two planes.

Holder, Reamer, Floating

Scully-Jones & Co., Railway Exchange Building, Chicago, Ill.

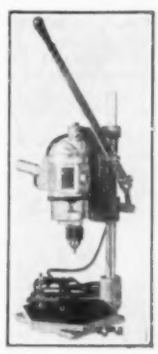
"American Machinist," Oct. 7, 1920

This floating holder is used for holding reamers in turret lathes and for work where it is important that the reamer be permitted to float freely in its axis of rotation and find its own center so as to insure straight round holes. Short-shank reamers can be used in this holder, thus reducing the cost of high-speed finishing reamers. It can be furnished with various types of collets for driving all types of reamer shanks and all styles of finishing tools. A shank to fit any size of turret lathe, or any size of taper shank to fit drilling-machine spindles or lathe tailstocks, can be furnished. Four sizes are made.

Drilling Stand, Bench

Black & Decker Manufacturing Co., Baltimore, Md.

"American Machinist," Oct. 7, 1920



This stand takes ¼, ⅜, 7/16, ½ and ¾-in. Black & Decker portable electric drills. The feed lever gives a feed ratio of 6 to 1. In the base are six tapped holes to accommodate ⅜-in. studs used to clamp work in place. Specifications: Height (bottom of base to top of vertical column), 30 in. Vertical adjustment of drill, 12 in. Drilling radius (distance from center of drill bit to circumference of vertical column), 7 in. Horizontal adjustment of drill, 360 deg. Feed (vertical travel of drill when operated by feed lever), 4 in. Net weight, 70 lb. Shipping weight, 110 lb. Shipping dimensions, 19 x 14 x 33 in.

Tools, Radius, Lathe and Planer, Standard

R. G. Smith Tool and Manufacturing Co., 315-17 Market St., Newark, N. J.

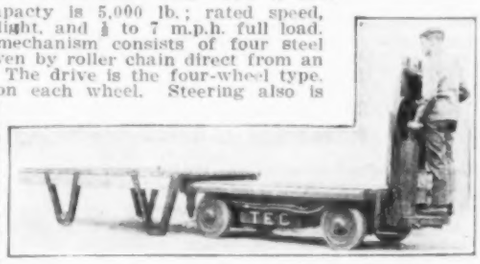
"American Machinist," Oct. 7, 1920

A set of tools comprises a spring toolholder, and cutters from 1/16 to 1 in. both convex and concave varying by 16ths of an inch, also a 60-deg. cutter for cutting threads and a cutting-off tool. All cutters are of the formed type and need be ground on the face only. If the faces are ground radially the original shape will be preserved until the cutters have been used up by grinding. Special cutters and holders can be furnished to order.

Truck, Platform, Industrial, "Tec"

Terminal Engineering Co., Inc., 17 West 44th St., New York.

"American Machinist," Oct. 7, 1920



The rated capacity is 5,000 lb.; rated speed, ½ to 10 m.p.h. light, and ½ to 7 m.p.h. full load. The elevating mechanism consists of four steel screw jacks driven by roller chain direct from an electric motor. The drive is the four-wheel type, with a motor on each wheel. Steering also is done through the four wheels. The platforms have pressed steel legs and 2-in. spruce planking. Specifications: Drive and elevating motors, G.E., 60 volt, series wound. Frame, 4-in. steel channel. Tires, 20 x 5 in. solid rubber. Springs, semi-elliptic, 2 x 26 in. leaf. Controller, drum type. Coupler for trailers, automatic, uncoupled from dash. Accessories: Red and white electric running lights with Conaphore lens, electric horn, license plate brackets, Sangamo ampere hour meter, Veeder odometer, combination latch lock on controller.

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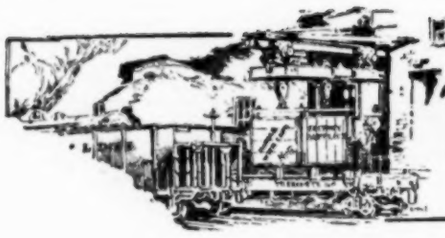


THE WEEKLY PRICE GUIDE

IRON AND STEEL

PIG IRON—Quotations compiled by The Matthew Addy Co.:

	Current	One Year Ago
CINCINNATI		
No. 2 Southern	$46.50	$30.35
Northern Basic	51.30	27.55
Southern Ohio No. 2	48.50	28.55
NEW YORK—TIDEWATER DELIVERY		
2X Virginia (Silicon 2.25 to 2.75)	57.12	32.40
Southern No. 2 (Silicon 2.25 to 2.75)	52.10	35.20
BIRMINGHAM		
No. 2 Foundry	42.00@45.00	29.25
PHILADELPHIA		
Eastern Pa., No. 2x, 2.25-2.75 sil.	51.25	29.00-30.00
Virginia No. 2	50.00*	33.10
Basic	51.00†	26.75
Grey Forge	48.00*	26.75
CHICAGO		
No. 2 Foundry local	47.00	26.75
No. 2 Foundry, Southern	48.67	28.00
PITTSBURGH, INCLUDING FREIGHT CHARGE FROM VALLEY		
No. 2 Foundry	49.56	28.15
Basic	48.96	27.15
Bessemer	51.96	29.35

* F.o.b. furnace. † Delivered.

STEEL SHAPES—The following base prices per 100 lb. are for structural shapes 3 in. by ¼ in. and larger, and plates ¼ in. and heavier, from jobbers' warehouses at the cities named:

	New York			Cleveland		Chicago	
	Current	One Month Ago	One Year Ago	Current	One Year Ago	Current	One Year Ago
Structural shapes	$4.30	$4.58	$3.47	$3.44	$3.37	$4.08	$3.47
Soft steel bars	4.75	4.73	3.37	3.84	3.27	3.98	3.37
Soft steel bar shapes	4.75	4.73	3.37	3.84	3.27	3.98	3.37
Soft steel bands	6.43	6.43	4.07	6.25	....	....	....
Plates, ¼ to 1 in. thick	4.50	4.78	3.67	3.64	3.57	4.28	3.67

BAR IRON—Prices per 100 lb. at the places named are as follows:

	Current	One Year Ago
Mill, Pittsburgh	$4.25	$2.77
Warehouse, New York	4.75	3.37
Warehouse, Cleveland	3.52	3.27
Warehouse, Chicago	4.12	3.37

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Large Mill Lots Pittsburgh	New York Current	New York One Year Ago	Cleveland	Chicago
No. 10	3.55-7.00	7.25@8.00	4.57	6.75	7.13
No. 12	3.60-7.05	7.30@8.05	4.62	6.80	7.18
No. 14	3.65-7.10	7.35@8.10	4.67	7.35	7.23
No. 16	3.75-7.20	7.45@8.20	4.77	7.45	7.33
Black					
Nos. 18 and 20	4.20-6.20	8.40@9.80	5.30	8.30	7.90
Nos. 22 and 24	4.25-6.25	8.45@9.85	5.35	8.35	7.95
No. 26	4.30-6.30	8.50@9.90	5.40	8.40	8.00
No. 28	4.35-6.35	8.60@10.00	5.50	8.50	8.10
Galvanized					
No. 10	4.70-8.00	8.90@11.00	5.75	8.50	8.25
No. 12	4.80-8.10	9.00@11.00	5.85	8.60	8.30
No. 14	4.80-8.10	9.00@11.10	5.85	8.60	8.45
Nos. 18 and 20	5.10-8.40	9.25@11.40	6.15	8.90	8.75
Nos. 22 and 24	5.25-8.55	9.40@11.55	6.30	9.05	9.15
No. 26	5.40-8.70	9.55@11.70	6.45	9.20	9.30
No. 28	5.70-9.00	9.85@12.00	6.75	9.50	9.60

Acute scarcity in sheets, particularly black, galvanized and No. 16 blue enameled.

Automobile sheets are unavailable except in fugitive instances, when prices are 9.45c per lb. for No. 16; 9.50 for Nos. 18 and 20, and 9.55c for Nos. 22 and 24.

COLD FINISHED STEEL—Warehouse prices are as follows:

	New York	Chicago	Cleveland
Round shafting or screw stock, per 100 lb. base	$6.36	$5.90	$5.50
Flats, square and hexagons, per 100 lb. base	6.86	6.40	6.50

DRILL ROD—Discounts from list price are as follows at the places named:

	Per Cent.
New York	50
Cleveland	50
Chicago	50

NICKEL AND MONEL METAL—Base prices in cents per pound F.O.B. Bayonne, N. J.

Nickel	
Ingot and shot	43
Electrolytic	45

Monel Metal			
Shot and blocks	35	Hot rolled rods (base)	42
Ingots	38	Cold rolled rods (base)	56
Sheet bars	40	Hot rolled sheets (base)	55
Special Nickel and Alloys			
Malleable nickel ingots			45
Malleable nickel sheet bars			47
Hot rolled rods, Grades "A" and "C" (base)			60
Cold drawn rods, grades "A" and "C" (base)			72
Copper nickel ingots			42
Hot rolled copper nickel rods (base)			52
Manganese nickel hot rolled (base) rods "D" — low manganese			64
Manganese nickel hot rolled (base) rods "D"— high manganese			67

Domestic Welding Material (Swedish Analysis)—Welding wire in 100-lb lots sells as follows, f.o.b. New York: $\frac{3}{32}$, 8½c. per lb.; ⅛, 8c.; $\frac{5}{32}$ to ¼, 7½c. Domestic iron sells at 12c. per lb.

MISCELLANEOUS STEEL—The following quotations in cents per pound are from warehouse at the places named:

	New York Current	Cleveland Current	Chicago Current
Openhearth spring steel (heavy)	7.00	8.00	9.15
Spring steel (light)	10.00	11.00	12.25
Coppered bessemer rods	9.00	8.00	6.85
Hoop steel	6.68	6.50	5.43
Cold-rolled strip steel	12.50	8.25	11.00
Floor plates	6.91	6.00	6.88

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the Pittsburgh basing card:

BUTT WELD					
Inches	Steel Black	Steel Galvanized	Inches	Iron Black	Iron Galvanized
⅛ to 3	54-57½%	41½-44%	⅛	15½-25½%	+1½-11%
			¼	19½-29½%	1½-11%
			⅜ to 1½	24½-34½%	8 -18½%
LAP WELD					
2	47 -50½%	34½-38%	1¼		
2½ to 6	50 -53½%	37½-41%	1½		
7 to 12	47 -50½%	33½-37%	2	20½-28½%	6½-14½%
13 to 14	37½-41 %		4½ to 6	22½-30½%	9½-17½%
15	35 -38½%		2½ to 4	22½-30½%	9½-17½%
			7 to 12	19½-27½%	6½-14½%
BUTT WELD, EXTRA STRONG PLAIN ENDS					
⅛ to 1½	52 -55½%	39½-43%	⅛ to 1½	24½-34½%	9½-19½%
2 to 3	53 -56½%	40½-44%			
LAP WELD, EXTRA STRONG PLAIN ENDS					
2	45 -48½%	33½-37%	1¼		
2½ to 4	48 -51½%	36½-40%	1½		
4½ to 6	47 -50½%	35½-39%	2	21½-29½%	8½-16½%
7 to 8	43 -46½%	29½-33%	2½ to 4	23½-31½%	11½-19½%
9 to 12	38 -41½%	24½-28%	4½ to 6	22½-30½%	10½-18½%
			7 to 8	14½-22½%	2½-10½%
			9 to 12	9½-17½%	5½-+2½%

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
⅛ to 3 in. steel butt welded	38%	22%	39%	30%	54% 40%	40½@30 %
2½ to 6 in. steel lap welded	33%	18%	41%	26%	50@40%	37½@27½%

Malleable fittings. Classes B and C, banded, from New York stock sell at plus 45%. Cast iron, standard sizes, plus 5%.

METALS

MISCELLANEOUS METALS—Present and past New York quotations in cents per pound, in carload lots:

	Current	Month Ago	Year Ago
Copper, electrolytic	16.50	18.62	22.50
Tin in 5-ton lots	39.50	46.50	56.50
Lead	8.00	9.00	6.25
Zinc	8.00	8.50	7.60
ST. LOUIS			
Lead	7.25	8.00	6.00
Zinc	7.50@7.70	7.70@8.05	7.15

At the places named, the following prices in cents per pound prevail, for 1 ton or more:

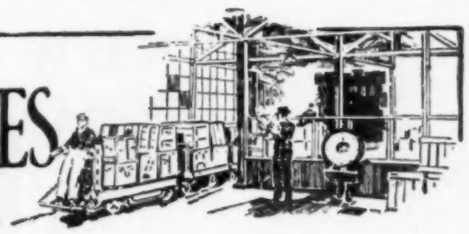
	New York Current	New York Month Ago	New York Year Ago	Cleveland Current	Cleveland Year Ago	Chicago Current	Chicago Year Ago
Copper sheets, base	29.50	33.50	33.50	30.00	35.50	36.00	36.50
Copper wire (carload lots)	31.25	31.25	30.75	27.00	30.50	29.00	26.00
Brass sheets	28.50	28.50	32.00	30.00	33.00	27.00	28.00
Brass pipe	28.00	33.00	36.00	33.00	39.00	34.00	37.00
Solder (half and half) (case lots)	35.00	38.00	45.00	29.50	41.00	38.00	38.50

Copper sheets quoted above hot rolled 16 oz., cold rolled 14 oz. and heavier, add 2c.; polished takes 5c. per sq.ft. extra for 20-in. widths and under; over 20 in., 7½c.

BRASS RODS—The following quotations are for large lots, mill. 100 lb. and over, warehouse; net extra:

	Current	One Year Ago
Mill	25.00	24.00
New York	27.00	28.00@29.75
Cleveland	29.00	29.00
Chicago	30.00	27.00

SHOP MATERIALS AND SUPPLIES



ZINC SHEETS—The following prices in cents per pound are f.o.b. mill + less 8% for carload lots..... 12.50

	Warehouse			
	—In Casks—		— Broken Lots —	
	Current	One Year Ago	Current	One Year Ago
Cleveland	15.30	12.50	14.70	13.00
New York	14.00	11.50	14.50	12.50
Chicago	14.50	16.50	14.95	16.00

ANTIMONY—Chinese and Japanese brands in cents per pound, in ton lots for spot delivery, duty paid:

	Current	One Year Ago
New York	7.25	9.50
Chicago	7.50	9.75
Cleveland	9.00	9.75

OLD METALS—The following are the dealers' purchasing prices in cents per pound:

	— New York —			
	Current	One Year Ago	Cleveland	Chicago
Copper, heavy, and crucible	13.50	17.00	12.00	13.50
Copper, heavy, and wire	13.00	16.00	11.75	12.50
Copper, light, and bottoms	11.00	14.00	10.00	11.00
Lead, heavy	5.50	4.75	5.50	6.00
Lead, tea	4.50	3.75	3.75	5.00
Brass, heavy	7.00	10.50	8.00	12.50
Brass, light	5.50	7.50	5.00	6.50
No. 1 yellow brass turnings	7.00	10.00	6.00	6.75
Zinc	4.50	5.00	3.75	5.00

ALUMINUM—The following prices are from warehouse at places named:

	New York	Cleveland	Chicago
No. 1 aluminum, 98 to 99% pure, in ingots for remelting (1-15 ton lots), per lb	$33.00	$30.00	$33.50

COPPER BARS—From warehouse sell as follows in cents per pound, for ton lots and over:

	Current	One Year Ago
New York (round)	38.00	32.00
Chicago	29.00	31.00
Cleveland	32.00	35.00

BABBITT METAL—Warehouse price per pound:

	—New York—		—Cleveland—		— Chicago —	
	Current	One Year Ago	Current	One Year Ago	Current	One Year Ago
Best grade	80.00	90.00	49.00	70.00	45.00	60.00
Commercial	40.00	50.00	19.50	16.50	11.00	13.00

NOTE—Price of babbitt metal is governed largely by formula, no two manufacturers quoting the same prices. For example, in New York we quote the best two grades, although lower grades may be obtained at from $16 to $20.

SHOP SUPPLIES

NUTS—From warehouse at the places named, on fair-sized orders, the following amount is deducted from list:

	— New York —		— Cleveland —		— Chicago —	
	Current	One Year Ago	Current	One Year Ago	Current	One Year Ago
Hot pressed square	+ $6.00	$1.50	List net	$2.25	+1.15	1.85
Hot pressed hexagon	+ 6.00	1.50	List net	2.25	+1.15	1.85
Cold punched hexagon	+ 6.00	1.50	List net	2.25	+1.15	1.30
Cold punched square	+ 6.00	1.50	List net	2.25	+1.15	1.30

Semi-finished nuts, ⅞ and smaller, sell at the following discounts from list price:

	Current	One Year Ago
New York	30%	50-10%
Chicago	40%	50%
Cleveland	50%	60-10%

MACHINE BOLTS—Warehouse discounts in the following cities:

	New York	Cleveland	Chicago
½ by 4 in. and smaller	+ 20%	25%	20%
Larger and longer up to 1½ in. by 30 in.	+ 20%	25%	10%

WASHERS—From warehouses at the places named the following amount is deducted from list price:

For wrought-iron washers:

New York..... list Cleveland..... $2.00 Chicago..... $1.90

For cast-iron washers, ⅜ and larger, the base price per 100 lb. is as follows:

New York..... $7.00 Cleveland..... $4.50 Chicago..... $5.50

CARRIAGE BOLTS—From warehouses at the places named the following discounts from list are in effect:

	New York	Cleveland	Chicago
½ by 6 in. and smaller	+ 20%	25%	10%
Larger and longer up to 1 in. by 30 in.	+ 20%	20%	5%

COPPER RIVETS AND BURS sell at the following rate from warehouse:

	Rivets		Burs	
	Current	One Year Ago	Current	One Year Ago
Cleveland	20%	20%	10%	10%
Chicago	net	20%	net	20%
New York	30%	40%	net	20%

RIVETS—The following quotations are allowed for fair-sized orders from warehouse:

	New York	Cleveland	Chicago
Steel ⅞ and smaller	List Net	40%	30%
Tinned	List Net	40%	30%

Boiler, ½, ⅝, 1 in. diameter by 2 to 5 in. sell as follows per 100 lb.:

New York..... $6.00 Chicago..... $5.73 Pittsburgh..... $4.5

Structural, same sizes:

New York..... 7.10 Chicago..... 5.83 Pittsburgh..... $4.60

MISCELLANEOUS

SEAMLESS DRAWN TUBING—The base price in cents per pound from warehouse in 100-lb. lots is as follows:

	New York	Cleveland	Chicago
Copper	$31.00@$32.00	$36.00	$35.00
Brass	30.00@ 31.00	36.00	34.00

The prices, of course, vary with the quantity purchased. For lots of less than 100 lb., but not less than 75 lb., the advance is 1 c.; for lots of less than 75 lb., but not less than 50 lb., 2½c. over base (100-lb. lots); less than 50 lb., but not less than 25 lb., 5c. should be added to base price; quantities from 10-25 lb., extra is 10c.; less than 10 lb., add .15-20c.

Double above extras will be charged for angles, channels and sheet metal mouldings if ordered in above quantities. Above extras also apply to brass rod other than standard stock sizes—stock sizes being considered as ⅛-2 in. inclusive in rounds, and ¼-1½ in., inclusive, in square and hexagon—all varying by thirty seconds up to 1 in. by sixteenths over 1 in. On shipments aggregating less than 100 lb., there is usually a boxing charge of $1.50.

LONG TERNE PLATE—In Chicago No. 28 primes from stock sell, nominally, for $11.50 per 100 lbs.

In Cleveland—$10 per 100 lbs.

COTTON WASTE—The following prices are in cents per pound:

	— New York —			
	Current	One Year Ago	Cleveland	Chicago
White	15.00@17.00	13.00	16.00	11.00 to 14.00
Colored mixed	9.00@14.00	9.00-12.00	12.00	9.50 to 12.00

WIPING CLOTHS—Jobbers' price per 1000 is as follows:

	13½x13½	13½x20½
Cleveland	55.00	65.00
Chicago	41.00	49.50

SAL SODA sells as follows per 100 lb.:

	Current	One Month Ago	One Year Ago
New York	$2.00-2.10	$2.00	$1.75
Philadelphia	2.75	2.75	1.75
Cleveland	3.00	3.00	2.50
Chicago	2.00	2.75	2.00

ROLL SULPHUR in 360-lb. bbl. sells as follows per 100 lb.:

	Current	One Month Ago	One Year Ago
New York	$3.40-3.90	$3.90	$3.65
Philadelphia	3.65	3.65	3.87½
Chicago	4.10	5.00	4.12½

COKE—The following are prices per net ton at ovens, Connellsville:

	October 25	October 18	October 11
Prompt furnace	$16.00@$16.50	$16.00@$16.50	$16.00@$16.50
Prompt foundry	17.00@ 18.00	17.00@ 18.50	17.00@ 18.50

FIRE CLAY—The following prices prevail:

		Current
Ottawa, bulk in carloads	Per Ton	$8.00
Cleveland	100-lb. bag	1.00

LINSEED OIL—These prices are per gallon:

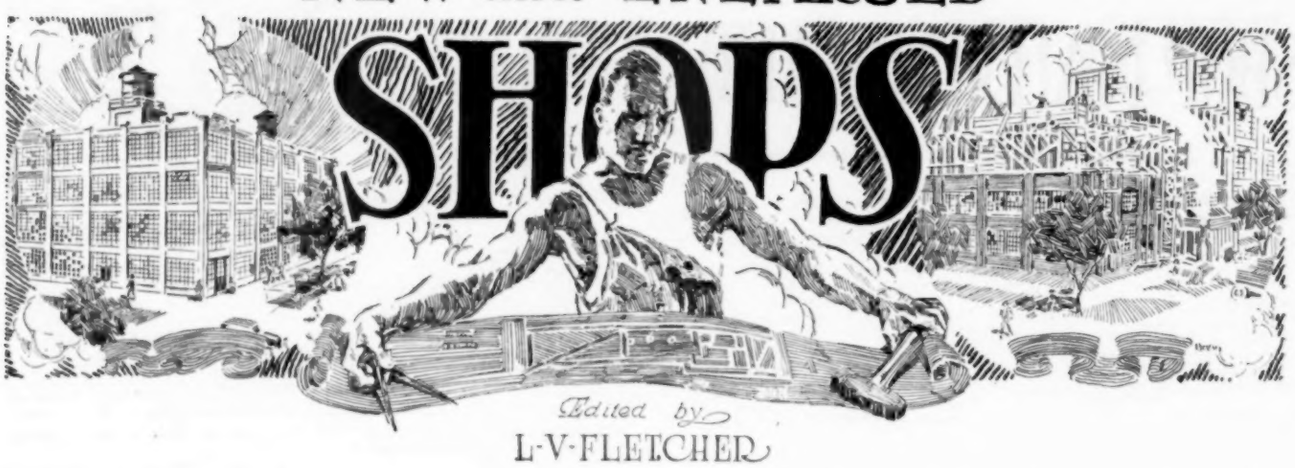
	—New York—		—Cleveland—		—Chicago—	
	Current	One Year Ago	Current	One Year Ago	Current	One Year Ago
Raw in barrels, (5 bbl. lots)	$1.15	$2.15	$1.25	$2.50	$1.25	$2.37
5-gal cans	1.30	2.30	1.50	2.75	1.50	2.57
1-gal cans (6 to case)	1.40	....	....	....	....	....

WHITE AND RED LEAD—Base price per pound:

	— Red —				— White —	
	Current		One Year Ago		Current	One Year Ago
	Dry	In Oil	Dry	In Oil	Dry and In Oil	Dry and In Oil
100 lb. keg	15.50	17.00	13.00	14.50	15.50	13.00
25 and 50-lb. kegs	15.75	17.25	13.25	14.75	15.75	13.25
12½-lb. keg	16.00	17.50	13.50	15.00	16.00	13.50
5-lb. cans	18.50	20.00	15.00	16.50	18.50	15.00
1-lb. cans	20.50	22.00	16.00	17.50	20.50	16.00

500 lb. lots less 1% discount. 2000 lb. lots less 10-20½% discount.

NEW and ENLARGED



Edited by
L-V-FLETCHER

Machine Tools Wanted

If in need of machine tools send us a list for publication in this column

D. C., Washington—The Bureau of Supplies & Accounts, Navy Dept.—one gate shear for cutting 1¼ in. steel for the new structural shop at Mare Island, Cal.

Md., Baltimore—The Maccar Motortruck Co., 1010 West North Ave., A. Hann, Purch. Agt.—22-in. lathe, motor driven from bed, power saw and general automobile repair tools (used and in good condition.)

N. Y., New York (Borough of Manhattan)—I. Beck, 68 East 131st St.—one screw machine, No. 2 Pratt & Whitney, or equivalent.

N. Y., New York (Borough of Manhattan)—Pioneer Novelty Mfg. Co., 229 East 29th St.—automatic press, 150 to 200 ton pressure Zeh & Hahneman make preferred.

N. Y., New York (Borough of Manhattan)—Platmeyer & Co., 126 Liberty St.—machine for making hot pressed nuts to ⅞ in. capacity.

N. Y., Buffalo—The Fedders Mfg. Co., Inc., 57 Tonawanda St., manufacturer of auto radiators—one double crank power drawing press, (used).

N. Y., Buffalo—The Natl. Lamp Works of the General Electric Co., 1495 Elmwood Ave.—equipment for the manufacture of electric lamps.

N. Y., Buffalo—The Rustless Rule Co., 9 Lafayette Ave.—riveters and drill presses.

Pa., Lehcigh (Moscow P. O.)—The Lehcigh Valley Coal Co.—lathes.

Pa., Philadelphia—The Atlantic Refining Co., 32d and Passyunk Sts.—one pipe threading and cutting machine.

Pa., Philadelphia—The Erie Ave. Auto Supply Co., 7th St. and Erie Ave.—garage equipment.

Pa., Philadelphia—The Stalium Metals Corp. of America, 226 Lafayette Bldg.—machine tools for new plant in Chester.

Pa., Reading—The Reading Steel Castings Co., Tulpehocken St., along the tracks of the Lehigh Valley RR.—Nine 21 in. turret lathes with cross slides, five 27 in. turret lathes with cross slides, three 18 in. turret lathes with cross carriage, four high speed turret lathes for brass work, all to be arranged for belt drive; one boring machine.

Pa., Reading—The Reading Valve & Piping Co.—turret lathes.

N. C., Salem—The Crawford Mill Supply Co., 438 Main St.—miscellaneous machine tool equipment, including Universal milling machine and small lathe.

Va., Richmond—T. T. Hulcher, 11 South 7th St.—key seating machine, 32 in. lathe and power saw.

Va., Richmond—The Richmond Metal Products Co., 326 South 5th St.—M. J. Cohn, Purch. Agt.—die slotter.

Va., Richmond—The Tredegar Iron Wks., 5th St., T. H. Twigg, Purch. Agt.—lathes, planers, drill presses and machinery of all kinds.

Va., Richmond—The Union Machine Co., 118 South 8th St.—one cylinder boring machine, one small grinder and one 30 to 36 in. x 8 to 12 ft. lathe.

Ill., Chicago—The International Harvester Co. of America, Inc., 606 South Michigan Ave.—machine tools.

Ill., Chicago—The U. & J. Carburetor Co., 510 West Van Buren St.—1 slitting machine for medium sized stock up to 18 in. width, (new or used).

Ill., Chicago—E. Youngstrom, 2837 South State St.—Collier-Smith quick work hammer (used.)

Mich., Detroit—H. R. Hoover, 302 Larchmont Ave.—standard punching machine.

Mich., Detroit—The Square D. Co., 1400 Rivard St., manufacturer of electric safety devices—two 2½ consolidated presses, (new or used).

Mich., Flint—Pohrt-Schmelzer Co., 1906 Beach St.—punch press, geared, 3½ in. minimum stroke, 10 ton pressure.

O., Cleveland—The Maxwell Tool & Supply Co.—two 18 in. to 20 in. swing, 6 ft. to 8 ft. bed, back geared lathes (used.)

O., Columbus—The J. Ohlen & Sons Saw Mfg. Co., one square west of the west end of Buttles St.—one 42 in. 3 drum, endless belt sander, complete, (used).

Wis., Milwaukee—The Krueger Motor Car Co., 485 Jefferson St., W. Krueger, Purch. Agt.—drill press and one lathe suitable for garage repair work.

Wis., Milwaukee—The Meehan Mfg. Co., 709 M. & M. Bank Bldg.—W. Meehan, Purch. Agt.—
One 14 x 18 in. engine lathe.
One 20 in. drill press.
One punch press, 18 in. throat.
One power flanger.
One power shear.
One power pipe threader.
One No. 2 power hack saw.
One emery grinder.
Two pneumatic hammers.
One electric drill.
One forge.
One anvil.
One blacksmith vise.

Wis., Milwaukee—The Surf Mfg. Co., 109 Clinton St., manufacturer of washing machines—two drill presses and one lathe.

Wis., Plymouth—The Plymouth Fdry. & Machine Co.—machines and machine tools, including drills, lathes, presses, etc.

Wis., Racine—The National Machine Co., 1825 North Erie St.—boring, milling and drilling machines.

Wis., Racine—The Wohlrab Gear Co., 4th St. and Lake Ave., A. Wohlrab, Purch Agt.—additional machine tools, including gears, cutters, lathes and drill presses.

Wis., West Allis—The West Allis Motor Co., 557 73d Ave.—repair machinery for garage service station.

Cal., Los Angeles—The Bedell Eng. Co., 3710 South Alameda St.—vertical boring mill.

Machinery Wanted

Me., Masardis—S. P. Dean—Portable sawmill outfit complete, ready to operate.

N. Y., Buffalo—The Angola Tire & Rubber Co., 270 North Division St.—machinery for the manufacture of rubber tires.

Fla., Haines City—The Fruit Growers Express Co., c/o A. J. Nye, Orlando—equipment for ice plant.

Ill., Chicago—G. A. Copp, 875 Rush St. (cabinet workers)—one 24 in. band saw, one 24 in. cabinet planer and one 12 in. hand jointer.

Ill., Chicago—The Illinois Malleable Iron Co., 1801 Diversy Blvd.—one 15 ton electric traveling crane.

O., Columbus—The Climax Rubber Co., 21 West Gay St., N. F. Blair, Wade Bldg., Cleveland, Purch. Agt.—1 vulcanizer, 2 rubber milling machines and other equipment for the new plant at Delaware, O.

Wis., Milwaukee—H. A. Poppert, 505 Cedar St.—brass foundry equipment, including blowers.

Wis., Schleisingerville—The Storck Ice Cream Co.—machinery for the manufacture of ice cream.

Wis., Sheboygan—The Sheboygan Dairy Products Co., 936 North Water St.—new machinery for dairy products factory at Madison.

Wis., Wauwatosa—The Aromatic Chemical Co., 61st St. and Motor Ave.—special machinery for the manufacture of extracts, perfumery, etc.

Ont., Toronto—The Shale Brick Co. of Canada, Crown Office Bldg.—brick presses and cutters for plant in Cooksville.

Metal Working

NEW ENGLAND STATES

Conn., Hartford—A. Cohn, 25 Russell St., plans to build a 1 story, 35 x 50 ft. garage, on Russell St. Estimated cost, $10,000. Berenson & Moses, 1026 Main St., Archt.

Conn., Hartford—R. Pallotti & Son, 26 State St., will build a 1 story, 50 x 60 ft. garage, on Otis St. Estimated cost, $10,000. Noted Sept. 2

Conn., Westport—Hunt & Downs, State St., have awarded the contract for the construction of a 2 story, 55 x 110 ft. garage. Cost between $20,000 and $25,000.

Conn., West Haven—The West Haven Mfg. Co., 22 Elm St., manufacturer of hack saws, plans to build a 2 story addition to its plant. Estimated cost, $10,000. R. W. Foote, 185 Church St., New Haven, Archt.

Me, Augusta—The Fidelis Phonograph Corp. plans to build an addition to its factory. Estimated cost, $75,000.

Me., Farmington—The Morton Motor Co. will build a 1 story, 60 x 115 ft. garage. Estimated cost, $25,000. Noted Oct. 14.

Mass., Boston—The Boston Herald, 171 Tremont St., will soon award the contract for the construction of a 4 story addition to its publishing plant, on Avery St. H. B. Alden, 15 Exchange St., Archt.

Mass., Chicopee—H. A. Biddle, St. James Ave., has awarded the contract for the construction of a 1 story garage. Estimated cost, $10,000.

Mass., East Lexington (Lexington P. O.)—G. H. Childs, Lexington, has awarded the contract for the construction of a 1 story, 50 x 90 ft. auto service station, on Massachusetts Ave., here. Estimated cost, $12,000.

Mass., Everett (Boston P. O.)—The Boston Elevated Ry Co., 108 Massachusetts Ave., Boston, will build several car shops here. Estimated cost, $3,000,000. Noted Oct. 14.

Mass., New Bedford—F. W. Greene, Jr., c/o LaBrode & Bullard, Archts., 255 Union St., plans to build a 1 story garage on Kempton St. Estimated cost, $30,000.

Mass., South Boston (Boston P. O.)—The Waldorf Lunch Co., 169 High St., has awarded the contract for the construction of a 1 story, 80 x 135 ft. garage, on D St. Estimated cost, $50,000.

Mass., Springfield—W. N. Potter & Sons, Main St., will build a 1 story, 30 x 85 ft. garage, on Page Blvd. Estimated cost, $15,000.

Mass., Worcester—Hotel Garage, Portland St., will soon award the contract for the construction of a 2 story, 58 x 135 ft. addition to its garage. Estimated cost, $75,000. E. T. Chapin, State Mutual Bldg., Archt.

Mass., Worcester—E. F. Mathews, 42 Chatham St., will soon award the contract for the construction of a 2 story, 150 x 180 ft. garage, on Pleasant St. Estimated cost, $200,000. J. Rice, 306 Main St., Archt.

R. I., Pawtucket—M. T. Condon, Lonsdale Ave., will soon award the contract for the construction of a 1 story garage. Estimated cost, $25,000. Private plans.

MIDDLE ATLANTIC STATES

D. C., Washington—W. W. Griffith, 1st and N Sts., has awarded the contract for the construction of a motor truck factory. Estimated cost, $300,000.

Md., Baltimore—S. W. Snitzer, 3454 Reisterstown Rd., will soon award the contract for the construction of a 3 story, 60 x 90 ft. garage, at 1419-23 Maryland Ave. Estimated cost, $50,000.

Md., Baltimore—A. Weiskittel & Son Co., 12th and Lombard Sts., will build a 1 story, 32 x 38 ft. foundry and cupola addition. Estimated cost, $6,000.

Md., Baltimore—The Wizard Check Indorser & Printing Machine Co., Calvert Bldg., will soon award the contract for the construction of three 1 story, 80 x 180 ft. factories.

N. J., Metuchen—The General Ceramics Co., 50 Church St., New York City, will soon award the contract for the construction of a 1 and 2 story addition to its factory here. Estimated cost, $400,000. D. Wortman, 116 Lexington Ave., New York City, Archt. and Engr.

N. J., Trenton—J. Zorn, 14 Colonial Ave., will build a 1 story, 99 x 103 ft. garage. Estimated cost, $19,000.

N. Y., New York (Borough of Brooklyn)—The Colonial Mantle and Refrigerating Co., 494 Dumont Ave., will build a 1 story, 40 x 100 ft. addition to its factory. Estimated cost, $40,000.

N. Y., New York (Borough of Brooklyn)—L. Getzoff, c/o M. L. Reisler, Archt., 1613 Pitken Ave., will build a 1 story, 75 x 100 ft. garage, on Dumont and Blakes Aves. Estimated cost, $30,000.

N. Y., New York (Borough of Brooklyn)—The Martha Garage Corp., 1687 President St., will build a 1 story, 105 x 130 ft. garage on Dean St. Estimated cost, $50,000.

N. Y., New York (Borough of Manhattan)—The Dollar Contg. Co., 25 West 140th St., will build a 1 story, 50 x 150 ft. garage on 150th St. Estimated cost, $50,000.

N. Y., New York (Borough of Manhattan)—The Transit Comn., 49 Lafayette St., has awarded the contract for the construction of additional shops at Lenox Ave. and 148th St. yards. Estimated cost, $460,000. Noted. Sept. 30.

N. Y., Buffalo—The National Lamp Wks. of the General Electric Co., 1495 Fillmore Ave., has awarded the contract for the construction of a 2 story, 82 x 322 ft. factory, at 757 East Ferry St. Estimated cost, $120,000.

N. Y., Buffalo—The Rustless Rule Co. has awarded the contract for the construction of a 1 story, 10 x 16 x 84 ft. factory, at 9 Lafayette Ave. Estimated cost, $7,000.

N. Y., Glendale—The Rubel Bros., Inc., Glenmore Ave., Brooklyn, will build a 2 story, 35 x 125 ft. plant here. Estimated cost, $50,000.

Pa., Chester—The Stalium Metals Corp. of America, 226 Lafayette Bldg., Philadelphia, plans to build a manufacturing plant here. Estimated cost, $50,000. R. Beard, 2349 North Woodstock St., Philadelphia, Archt.

Pa., Fernwood—The Eastern Fdry. & Machine Co., Ambler, has awarded the contract for the construction of a 1 story, 65 x 115 ft. factory here. Estimated cost, $20,000.

Pa., Hatboro—The Roberts & Mandor Stove Co., 11th St. and Washington Ave., Philadelphia, has awarded the contract for the construction of a 1 story, 60 x 100 ft. extension to its foundry here.

Pa., Philadelphia—Erie Ave. Auto Supply Co., 7th St. and Erie Ave., will soon award the contract for the construction of a 2 story, 60 x 80 ft. garage. Estimated cost, $10,000. P. Kuhn, 3058 North 8th St., Archt.

Pa., Pittsburgh—The Oil Well Supply Co., 215 Water St., has purchased a site and plans to build a warehouse and machine shop. Cost between $250,000 and $500,000.

SOUTHERN STATES

S. C., Columbia—The J. H. Minor Saw Mfg. Co., Shreveport, La., plans to build a saw manufacturing plant here.

S. C., Greenville—The Peerless Pole and Ladder Co. will soon award the contract for the construction of a 1 story, 60 x 160 ft. factory. Estimated cost, $50,000. J. E. Serrine Co., Greenville, Engrs. and Archts.

Tenn., Chattanooga—The Mutual Enamel Works Co., c/o D. P. Robinson, Engr. and Archt., 125 East 46th St., New York City, has awarded the contract for the construction of a foundry and plant here. Estimated cost, $800,000.

W. Va., MacDonald—The New River Co. has awarded the contract for the construction of a 1 story factory and machine shop, to cover 35,000 sq.ft. floor space. Cost between $225,000 and $250,000. Noted Oct. 14.

MIDDLE WEST STATES

Ill., Clearing—The Hamler Boiler & Tank Co., 3906 South Halsted St., Chicago, has awarded the contract for the construction of a 1 and 2 story, 100 x 300 ft. factory, on 66th St. and 60th Ave. Estimated cost, $500,000.

Ind., Fort Wayne—The International Harvester Co. of America, Inc., 606 South Michigan Ave., Chicago, is having plans prepared for the construction of a 1 and 2 story manufacturing plant, on Pontiac St. Estimated cost, $2,000,000. Day & Zimmerman, 611 Chestnut St., Philadelphia, Pa., Engrs. Noted Oct. 14.

O., Cleveland—The Atlas Fdry Co., Shaw Ave., has had plans prepared for the construction of a 1 story, 50 x 100 ft. addition to its foundry, on West 69th St. Estimated cost, $40,000. J. E. Moore, 1900 Euclid Ave., Archt. and Engr.

O., Cleveland—The Cleveland Steel Barrel Co., 9619 Neech Ave., has awarded the contract for the construction of a 1 story, 60 x 120 ft. factory. Estimated cost, $25,000. Noted Mar. 11.

O., Cleveland—J. Spang Baking Co., 2701 Barber Ave., has had plans prepared for the construction of a 1 story, 28 x 54 ft. garage. Estimated cost, $10,000. E. Huberty, 8017 Whitehorne Ave., Archt.

O., Cleveland—The Votteler Holtkamp Sparling Organ Co., 1404 Abbey Ave., has awarded the contract for the construction of a 1 story, 70 x 70 ft. factory, on East 30th St. and Meyers Ave. Estimated cost, $25,000.

Ill., East Moline—The Moline Pressed Steel Co. plans to build a 50 x 150 ft. enameling room and install new ovens at its plant here.

Mich., Detroit—The Motor City Stamping Co., c/o Stahl & Kinsey, Archts., 435 Woodward Ave., plans to build a 1 story, 98 x 100 ft. factory, on Knodell St., along the tracks of the Belt Line Ry. Estimated cost, $70,000.

O., Cleveland—The Berg-Clark Electric Co., 10207 Euclid Ave., plans to build a 2 story factory and warehouse on St. Clair Ave. and East 14th St. Estimated cost, $50,000. Private plans.

O., Cleveland—P. De Santis, 1303 Scovill Ave., plans to build a 1 story, 20 x 165 ft. garage, at 7421 Detroit Ave. Estimated cost, $15,000. Private plans.

Wis., Milwaukee — W. Schaefer, 995 Greenfield Ave., has awarded the contract for the construction of a 1 story, 50 x 60 rt. garage, on Greenfield St. Estimated cost, $12,000.

Wis., Plymouth—The Plymouth Fdry. & Machine Co. has awarded the contract for the construction of a 1 story, 150 x 162 ft. foundry and machine shop, on Stafford St. Estimated cost, $100,000.

Wis., Shawano—The Shawano Motor Car Co. has awarded the contract for the construction of a 2 story, 72 x 150 ft. garage, on Main St. Estimated cost, $100,000.

Wis., Sheboygan—Volerath Co., 13th and Michigan Aves., has awarded the contract for the construction of a 1 story, 180 x 200 ft. stamping shop. Estimated cost, $100,000.

Wis., West Allis—The West Allis Motor Co., 557 73rd Ave., has awarded the contract for the construction of a 1 story, 60 x 120 ft. garage. Estimated cost, $25,000.

WEST OF THE MISSISSIPPI

Mo., St. Louis—Foerster-Kaysing Iron Wks., 2710 North 25th St., will build a 1 story, 82 x 93 ft factory, at 2343 Montgomery St.

CANADA

Ont., Niagara Falls—The Oneida Community Co. has awarded the contract for the construction of three 1 and 2 story factories, including manufacturing, finishing and heat treating buildings. Estimated cost, $200,000. Noted Oct. 21.

Ont., Peterboro—The Laundryette Mfg. Co., 1190 East 152d St., Cleveland, will build a plan here for the manufacture of domestic laundry machines.

Ont., St. Catharines—The Canadian Fulton Motors, Ltd., has purchased the plant of the Marathon Co. here, and plans to enlarge same for its own use.

General Manufacturing

NEW ENGLAND STATES

Conn., Hartford—The New Haven Dairy Co., 201 Hazel St., New Haven, has awarded the contract for the construction of a 1 and 3 story addition to its dairy plant, on Walnut St., here. Estimated cost, $35,000.

Conn., Jewett City—The Fisk Rubber Co., Chicopee Falls, Mass., plans to build a factory here, for the manufacture of rubber tires, etc. G. B. Allen, 52 Vanderbilt Ave., New York City, Engr.

Mass., Cambridge—The Kingston Knitting Co., 37 Kingston St., Boston, has awarded the contract for the construction of a 3 story, 50 x 150 ft., textile mill here. Estimated cost $100,000. Noted Oct. 14.

Mass., Gardner—C. H. Hartshorn, Main St., will build a 3 story, 60 x 64 ft. factory for the manufacture of chairs. Estimated cost, $35,000. Noted Oct. 14.

Mass., Westfield—The Vitrified Wheel Co., Emery St., has awarded the contract for the construction of a 2 story, 45 x 100 ft. addition to its plant for the manufacture of emery wheels. Estimated cost, $40,000.

R. I., Pawtucket—J. and B. Costello, East Ave., manufacturers of tobacco, have awarded the contract for the construction of a 2 story, 50 x 185 ft. store and factory.

R. I., Providence—The Revere Rubber Co. has awarded the contract for the construction of a 2 story, 25 x 125 ft. factory on Valley St. Estimated cost, $40,000.

R. I., Warwick—The Warwick Textile Mills has awarded the contract for altering its plant. Estimated cost, $15,000.

MIDDLE ATLANTIC STATES

Md., Westport (Baltimore P. O.)—T. Matthews & Son Inc., Cedar St., along the tracks of the Western Maryland Ry., is building a 60 x 70 ft. planing mill. Estimated cost, $7,000.

N. J., East Orange—The Ward Baking Co., South Blvd. and St. Marys St., New York City, will soon award the contract for the construction of a 5 story side addition and a 3 story top addition to its bakery here. C. B. Comstock, 110 West 40th St., New York City, Engr. and Archt.

N. J., Hoboken—The Chocolate Manier will soon award the contract for the construction of a 2 story factory on Clinton St. Estimated cost, $100,000. Ballinger & Perrott, 328 Bway, New York City, Engrs. and Archts. Noted Sept. 30.

N. J., Trenton—The Jersey Keystone Wood Co. plans to build a 2 story, 40 x 150 ft. addition to its factory on Siegel St. Estimated cost, $7,000. J. O. Hunt, 114 North Montgomery St., Archt.

N. Y., Buffalo—The Angola Tire & Rubber Co., 270 North Division St., has awarded the contract for the construction of a 2 story, 50 x 96 x 126 ft. addition to its factory. Estimated cost, $55,000.

N. Y., Buffalo—The Standard Oil Co. of New York, Elk and Gorham Sts., has awarded the contract for the construction of a 2 story, 105 x 115 ft. addition to its factory. Estimated cost, $150,000.

Pa., Johnstown—The Johnstown Sanitary Dairy Co. plans to increase its capital from $100,000 to $300,000 to purchase the plant of the Sanitary Ice Cream & Cold Storage Co. and erect an additional plant. W. D. Gerber, Pres.

Pa., Philadelphia—Philadelphia Dyeing and Finishing Co., Frankford and Vandike Aves., is having plans prepared for the construction of a factory on Torredale Ave. Estimated cost, $50,000. M. W. Easby, Crozer Bldg., Archt.

Pa., Philadelphia—The Sleight Metallic Ink Co., 5907 Market St., has awarded the contract for altering its 2 story factory at 538 North 3d St. Estimated cost, $10,000.

Pa., Philadelphia—The Standard Crown Co., Hope and Palmer Sts., has awarded the contract for the construction of a 2 story, 67 x 212 ft. factory, on Clearfield and Masher Sts., for the manufacture of bottle tops. Estimated cost, $100,000. Noted Mar. 25.

Pa., Williamsport—W. R. Hoehn Silk Co., 331 Pine St., plans to build a 2 story, 45 x 135 ft. silk mill on Laurel St., along Old Canal. Estimated cost, $100,000.

SOUTHERN STATES

Fla., Haines City—The Fruit Growers Express Co., c/o A. J. Nye, Orlando, is building a 2 story, 60 x 100 ft. ice plant here. Estimated cost, $100,000.

Fla., Jacksonville—The Monarch Milling Co., 144 Cowart St., Chattanooga, Tenn., has purchased a site at Commodore Point, here, and plans to construct terminals, a warehouse and milling building. Estimated cost, $50,000.

Ga., Elberton—The Pitts Cotton Mfg. Co. will soon award the contract for the construction of a plant for the manufacture of cotton yarn for automobile tires.

N. C., Canton—The Champion Fibre Co. is building a 2 and 3 story, 60 x 350 ft. pulp and paper mill. B. C. Hope, Mechanical Engr.

N. C., Greensboro—The Armour Fertilizer Co. has awarded the contract for the construction of a 1 story, 80 x 180 ft. fertilizer and storage building. Estimated cost, $150,000.

MIDDLE WEST

Ill., Chicago—The Grant Baking Co., 3021 West Lake St., has awarded the contract for the construction of a 2 story, 100 x 150 ft. bakery on Lake St., near Sacramento Blvd. Estimated cost, $175,000.

Ind., Anderson—The Lynch Glass Co. has awarded the contract for the construction of a one story, 50 x 120 ft. addition to its factory. Estimated cost, $60,000.

Mich., Bay City—The General Cigar Co., Inc., 1308 Washington St., plans to build a 3 story, 48 x 100 ft. cigar factory. Estimated cost, $42,000. R. E. Bickel, Bay City, Archt.

Mich., Detroit—The Detroit Packing Co., 40 Bushey St., has awarded the contract for the construction of a 2 story packing plant on Springwells Ave. Estimated cost, $50,000.

O., Chagrin Falls—The Adams Bag. Co. has awarded the contract for the construction of a 1 story addition to its paper mill. Estimated cost, $50,000. Noted Sept. 9.

O., Cleveland—The Burns Bowe Baking Co., 3100 Vine Ct., will build a 1 story, 32 x 48 ft. addition to its plant. Estimated cost, $10,000. Private plans.

O., Cleveland—The Cyclone Fence Co., East 55th St., has awarded the contract for the construction of a 1 story, 60 x 80 ft. addition to its factory. Estimated cost, $40,000.

O., Cleveland—The Folding Box Co., 1900 West 3rd St., has had plans prepared for the construction of a 1 story 100 x 400 ft. factory. Estimated cost, $150,000. F. B. Stevens, Pres. H. M. Morse, Citizens Bldg., Archt. and Engr.

O., Cleveland—The Lakewood Lumber Co., 10225 Berra Rd., has awarded the contract for the construction of a 1 story, 33 x 44 ft. garage. Estimated cost, $15,000.

O., Cleveland—Vaclar Sorecke, 4045 East 71st St., manufacturer of sausage, plans to build a 1 story, 22 x 40 ft. factory and garage, at 7114 Harvard Ave., Estimated cost, $10,000. T. Cerny, 3905 East 55th St., Archt.

Wis., Denmark—The Danish Pride Milk Co., Sheboygan, plans to build a 3 story, 75 x 250 ft. condensory here. Estimated cost, $150,000.

Wis., Fond du Lac—The Fond du Lac Paper Co., c/o M. Green, 298 Forest Ave., plans to build a 1 and 2 story, 100 x 300 ft. paper board factory, along the bank of Lake Winnebago. Estimated cost, $100,000.

Wis., Fond du Lac—The Fountain City Ice Cream & Dairy Co., 218 South Main St., will soon award the contract for the construction of a 2 story, 60 x 112 ft. dairy plant. Estimated cost, $75,000. B. E. Mehner, 6 East Division St., Archt.

Wis., Fond du Lac—The Klinzing Barn Equipment Co., c/o J. F. Greenbeck, 52 South Main St., plans to build a 4 story, 60 x 159 ft. factory.

Wis., Fond du Lac—The Sheboygan Dairy Products Co., 936 North Water St., Sheboygan, is having plans prepared for the construction of a 2 story, 120 x 300 ft. dairy products factory, on West Division St., here. Estimated cost, $100,000. B. E. Mehner, 6 East Division St., Archt.

Wis., Jefferson—The Jefferson Rubber Co. has purchased a site on Main St. and plans to build a 2 story, 80 x 320 ft. tire factory. Estimated cost, $100,000.

Wis., Kenosha—Wisconsin Oxygen Hydrogen Co., Marion Ave., along the tracks of the Chicago & Northwestern R.R., is building a 45 x 109 ft. factory. Estimated cost, $60,000.

Wis., Madison—The Sheboygan Dairy Products Co., 936 North Water St., Sheboygan, plans to rebuild its 2 story, 60 x 150 ft. dairy products factory, on West Wilson St., here, which was recently destroyed by fire. Estimated cost, $100,000.

Wis., Milwaukee—The Shope Brick Co., 831 M. & M. Bank Bldg., has awarded the contract for the construction of a 1 story, 90 x 145 ft. factory, on State St. Estimated cost, $25,000. Noted Oct. 14.

Wis., Oostburg—The Danish Pride Milk Co., Sheboygan, plans to build a 3 story, 75 x 250 ft. condensory, on Main St., here. Estimated cost, $150,000.

Wis., Schleisingerville—The Storck Ice Cream Mfg. Co. plans to remodel and enlarge present plant and build a 3 story, 60 x 85 ft. addition on Main St. Estimated cost, $100,000.

Wis., Sheboygan—The Hartenberger Double Wall Silo Co., Sheboygan Falls, plans to build a 2 story, 70 x 110 ft. silo factory. Estimated cost, $50,000.

Wis., Tomahawk—The Tomahawk Pulp & Paper Co. is preparing plans for the construction of several industrial buildings, to include a 50 x 354 ft. main building, 37 x 136 ft. engine room, 47 x 98 ft. boiler room and a 50 x 231 ft. machine room. V. E. Labbe, Secy.

Wis., Two Rivers—The Wisconsin Pail & Basket Co. plans to rebuild its 2 story, 150 x 185 ft. pail factory, on Main St., which was recently destroyed by fire. Estimated loss, $200,000. J. Conant, Pres.

Wis., Wauwatosa—The Aromatic Chemical Co., 61st St. and Motor Ave., plans to rebuild its 2 story, 60 x 200 ft. chemical factory, on Motor Ave., which was recently destroyed by fire. Private plans.

CANADA

N. B., Grand Falls—The International Paper Co., Three Rivers, Que., will receive bids in November for the construction of a pulp and paper plant here, to have a capacity of 200 tons newsprints per day. Estimated cost, $1,000,000. P. T. Dodge, Pres.

Ont., Cooksville—The Shale Brick Co. of Canada, Crown Office Bldg., Toronto, plans to repair its brick plant here. Estimated cost, $30,000.

Ont., Elmira—The Elmira Creamery Co. has awarded the contract for the construction of a 2 story, 80 x 92 ft. addition to its creamery. Estimated cost, $100,000.

Ont., Smooth Rock Falls—The Mattagami Pulp & Paper Co. has awarded the contract for the construction of a 2 story pulp mill and store building. Estimated cost, $490,000.

Ont., Tillsonburg—The Canadian Cereal Mills Co., Stratford, plans to rebuild its flour mills here, which were recently destroyed by fire. Estimated cost, $500,000.

Ont., Toronto—The Dominion Envelope & Carton Co., 150 Duchess St., plans to build a 1 story, 300 x 500 ft. envelope and paper box factory, at Eastern Gap. Estimated cost, $500,000.

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